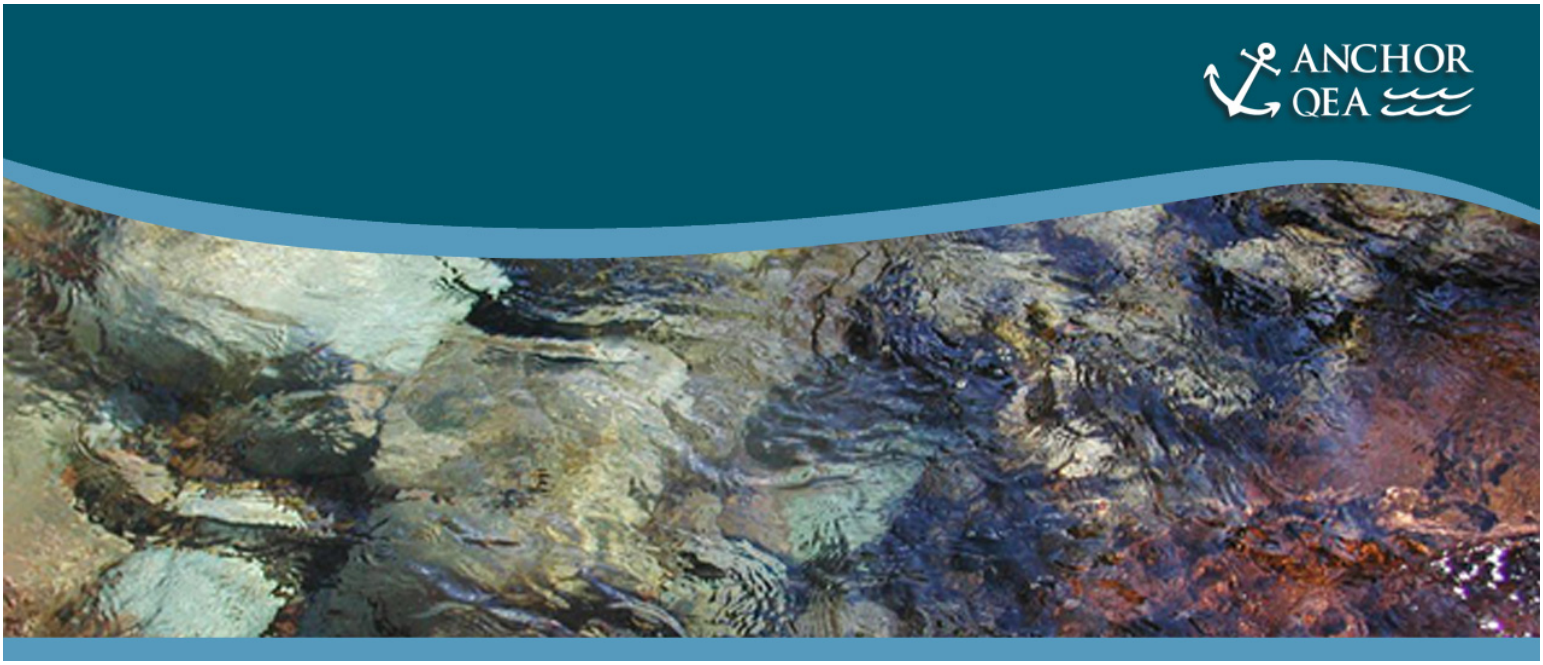

2013 DATA SUMMARY REPORT
HUDSON RIVER PCBS SUPERFUND SITE

Prepared for

The General Electric Company

Albany, New York

Prepared by

Anchor QEA, LLC

80 Glen Street, Suite 2

Glens Falls, New York 12801

In conjunction with

Environmental Standards, Inc.

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
Anchor QEA	Anchor QEA, LLC
ASTM	American Society for Testing and Materials
BMP	Baseline Monitoring Program
CAM	Corrective Action Memoranda
CCV	continuing calibration verifications
Cd	cadmium
cfs	cubic feet per second
COC	chain-of-custody
CU	Certification Unit
DDS	downstream deposition study
DO	dissolved oxygen
DQO	data quality objective
DSR	Data Summary Report
DVM	data verification module
EDD	electronic data deliverable
EDI	Equal Discharge Increment
eDMS	environmental data management system
EDV	electronic data verification
EPA	U.S. Environmental Protection Agency
ESI	Environmental Standards, Inc.
GC/ECD	Gas Chromatograph/Electron Capture Detector
GE	General Electric Company
IUPAC	International Union of Pure and Applied Chemistry
L	Liter
LCS	laboratory control spike
LD	laboratory duplicate
m	meter
MADIS	multiple aliquot depth integrating sampler
MDL	method detection limit
mg/kg	milligrams per kilogram

mGBM	modified Green Bay Method
mm	millimeter
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
ng/L	nanograms per liter
NYSDEC	New York State Department of Environmental Conservation
Pace	Pace Analytical Services, Inc.
Pb	Lead
PCB	polychlorinated biphenyl
PE	performance evaluation
QA/QC	quality assurance/quality control
QDQ	Qualitative Data Quality
QEA	Quantitative Environmental Analysis, LLC
RA CD	Remedial Action Consent Decree
RAM QAPP	Remedial Action Monitoring Quality Assurance Project Plan
RAMP	Remedial Action Monitoring Program
RL	reporting limit
RM	river mile
RPD	relative percent difference
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
TOC	total organic carbon
TSS	total suspended solids
USGS	U.S. Geological Survey

1 INTRODUCTION

This Data Summary Report (DSR) has been prepared on behalf of the General Electric Company (GE) by Anchor QEA, LLC (Anchor QEA) in conjunction with Environmental Standards, Inc. (ESI). In accordance with GE's approved *Phase 2 Remedial Action Monitoring Quality Assurance Project Plan* (Phase 2 RAM QAPP; Anchor QEA and ESI 2013a), this DSR includes a summary of the methods and results of several types of data collection activities conducted by GE in the Upper Hudson River in 2013 as part of the Phase 2 Remedial Action Monitoring Program (RAMP). Specifically, the following activities were conducted in 2013: 1) water column sampling performed during in-river remedial activities (at both near-field and far-field stations), as well as the water sampling performed in the off-seasons prior to and after those activities; 2) fish sampling performed in the Hudson River; and 3) a special downstream surface sediment study. This report documents the field and laboratory work performed as part of these sampling activities, reports the data, and presents the results of the associated data quality assessment. This report is submitted pursuant to Sections 2.9.1, 3.11, and 9.3.2.8 of the Phase 2 RAM QAPP.

1.1 Report Objectives

The objective of this DSR is to document the field and laboratory activities associated with the water samples, downstream special study sediment samples, and fish samples collected in 2013. This documentation includes describing the methods, reporting the data, and presenting the results of the applicable data quality assessments. Water samples were analyzed for polychlorinated biphenyls (PCBs), total and dissolved metals, and total suspended solids (TSS). Sediment samples were analyzed for PCBs, grain size, and total organic carbon (TOC). Fish samples were analyzed for PCBs and lipid content. Analytical methods for these matrices are identified in Sections 2.1.5, 2.2.1.1, and 2.3.4. Data interpretation presented in this report is limited to assessing data quality and usability.

2 METHODS

2.1 2013 Water Sampling Program

2.1.1 Near-field Monitoring

Near-field monitoring was performed in 2013 whenever dredging, capping, and/or backfilling activities occurred in the river. Daily near-field sampling was initiated on April 29, 2013, and was completed on November 15, 2013. Real-time water quality monitoring (for specific conductance, pH, temperature, turbidity, and dissolved oxygen concentration) continued until backfill placement was completed on December 6, 2013.

2.1.1.1 Sampling Locations

As specified in Section 2.3 of the Phase 2 RAM QAPP, the near-field monitoring area extended from upstream of dredging operations to a point approximately 300 meters (m) downstream of the operations. A summary of the location of each near-field monitoring station, Certification Units (CUs) monitored, and the dates of operation are presented in Table 2-1. Ambient water quality conditions immediately upstream of dredging operations were monitored with a single buoy (background buoy) (Table 2-1 and Figure 2-1a). Near-field conditions downstream of dredging operations were monitored using either: 1) buoys deployed along transects; or 2) far-field monitoring stations located in close proximity to dredging operations, as described in Corrective Action Memorandum No. 2 (CAM 2) (see Section 2.1.1.4). The locations of the downstream near-field monitoring stations are presented in Figures 2-1a through 2-1c.

The near-field cross-channel transects were located approximately 300 to 1,000 m downstream of dredging areas; distances varied to accommodate project logistics and safety concerns. The buoy locations were located in areas that minimized the potential for disruption of river vessel traffic. During the 2013 season, dredging operations were occasionally conducted in relatively close proximity to far-field automated sampling stations at Thompson Island Dam, Lock 5, and Waterford. During these periods, with U.S. Environmental Protection Agency (EPA) approval, these automated far-field stations were used in lieu of a near-field buoy transect, as described in Table 2-1.

The near-field buoy transects consisted of two to four monitoring buoys deployed downstream of operations along a transect perpendicular to river flow (Figures 2-1a through 2-1c). When dredging occurred in spatially separate areas of the river, near-field monitoring buoys were deployed downstream of each dredging operation and their locations routinely adjusted in the field in response to project logistics.

2.1.1.2 Sample Collection Procedures

Samples were collected using ISCO® automated samplers following procedures detailed in Appendix 2.3-1 of the Phase 2 RAM QAPP. When an automated far-field station was used in place of a near-field transect, sample collection procedures generally followed those employed when the station was used for far-field monitoring (Section 2.1.2.2.2 and Appendix 2.6-3 of the Phase 2 RAM QAPP). An exception was when the Waterford automated station was used for near-field compliance monitoring. In this instance, the automated station was supplemented with a monitoring buoy located on the east side of the navigation channel (Figure 2-1c). During these near-field compliance periods, the sample from the buoy and the Waterford automated station were composited to generate a single sample.

Background Buoy

The background buoy was located upstream of all dredging operations (Figure 2-1a). Sample aliquots were collected from mid-depth in the water column at 1-hour intervals and composited over 24 hours. These composite samples were submitted on a daily basis (Monday through Friday) for analyses of Aroclor PCBs and TSS. Samples collected on Saturday and Sunday were retrieved and submitted to the laboratory for analysis on the following Monday. Once per month, a grab sample was collected and submitted for analysis of PCBs by the modified Green Bay Method (mGBM); this method allows for determination of the concentrations of individual PCB homologs. The automated station at Thompson Island Dam was used for background monitoring once dredging upstream of the station was completed on October 31, 2013 (Table 2-1 and Figure 2-1a).

Near-field Transects

Near-field transect monitoring included the collection of discrete sample aliquots at each buoy location from mid-depth in the water column at 1-hour intervals, composited to

represent a 24-hour period. The composite samples from each buoy were then combined into a single, flow-proportioned composite and submitted for analyses of Aroclor PCBs and TSS. Flow proportioning was based on available hydrographic data collected in the vicinity of each near-field transect. Near-field samples were typically submitted on a daily basis (Monday through Friday) with samples collected on Saturday and Sunday typically retrieved and submitted to the laboratory for analysis on the following Monday. However, near-field transects located near agricultural intakes identified between Schuylerville and Stillwater were submitted 6 days a week (Sunday through Friday) to provide more frequent data to guide dredging operations.

As described above, the automated stations at Lock 5 and Waterford were used for both far-field and near-field monitoring depending on the proximity of the closest upstream dredging operation to each of the stations. During periods of use as a near-field station, an ISCO® automated sampler collected hourly aliquots, which were used to form a 24-hour composite sample. These samples were typically submitted daily to the laboratories for Aroclor PCB and TSS analyses except that samples collected on Saturday were retrieved and submitted to the laboratories on Sunday.

For the first 4 weeks of the 2013 dredging program, near-field samples were analyzed for hardness and for total and dissolved lead (Pb) and cadmium (Cd). Three additional samples were submitted for metals analysis later in the season during periods when dredging was occurring in areas with elevated sediment metals concentrations.[1] The near-field metals sampling was discontinued for the season on June 20, 2013 in accordance with criterion specified in Section 2.3.3 of the Phase 2 RAM QAPP.[2]

[1] The metals samples collected during one event, conducted on June 5, 2013, were lost by the courier during shipment to the analytical laboratory.

[2] The Phase 2 RAM QAPP specified: "If the data collected during that initial 4-week period show that the concentrations of dissolved Pb and Cd are substantially below the applicable Aquatic Acute Water Quality Standards, metals analyses will be discontinued for the remainder of the season." That criterion was met.

2.1.1.3 Non-routine Sampling

Weekly sampling was conducted at the Lock 5 automated station for informational purposes during periods when the station was not being used as either a near-field or a far-field monitoring station (Table 2-1) due to the proximity of dredging operations. These periods included May 13 to July 31, 2013 and August 21 to November 10, 2013. EPA requested this sampling to provide supplemental data for assessing dredging operations and to identify PCB concentrations in the river at an additional location upstream of agricultural intakes in River Section 3. Sample collection procedures during these periods were consistent with those of the far-field automated stations (described in Section 2.1.2.2.2). That is, an ISCO® automated sampler collected hourly aliquots to form a 24-hour composite sample that was submitted to the laboratories for Aroclor PCB and TSS analysis.

2.1.1.4 Corrective Action Memorandum Issued – Near-field Monitoring

Corrective actions were implemented during the project to adjust to changing field conditions and allow deviations from the monitoring protocols specified in the Phase 2 RAM QAPP. CAM 2 (Appendix A) discussed the use of automated far-field stations for near-field compliance and was approved by EPA in 2013. In accordance with that CAM, in some situations when dredging operations were conducted in relatively close proximity to shore-based far-field automated sampling stations, the far-field stations were used, with specific EPA concurrence, for near-field monitoring in lieu of using a cross-channel in-water buoy transect.

2.1.2 Far-field Monitoring

As specified in Section 2.4 of the Phase 2 RAM QAPP, far-field monitoring was initiated approximately 1 week prior to the start of dredging operations and continued until after dredging was completed and concentrations return to approximate baseline levels. In 2013, far-field monitoring was conducted from April 28 through November 15.

2.1.2.1 Sampling Locations

By design, the far-field monitoring program includes the collection of samples greater than 1 mile downstream from active dredging operations as well as background stations located

upstream of dredging. Most far-field monitoring stations are located at or near stations historically used for the Hudson River Baseline Monitoring Program (BMP) sampling (QEA and ESI 2004; Figure 2-2). The general locations of these stations (from upstream to downstream), as well as their purposes are as follows:

- Bakers Falls (background station)
- Rogers Island (used as a background station to calculate PCB loading originating upstream of remediation)
- Thompson Island Dam (remediation monitoring3 and off-season monitoring)
- Lock 5 at Schuylerville (remediation monitoring and off-season monitoring)
- Stillwater (remediation monitoring)
- Waterford (remediation monitoring, monitoring of loading to Lower Hudson River, off-season monitoring)
- Green Island (remediation monitoring)
- Albany (lower river monitoring)
- Poughkeepsie (lower river monitoring)

A summary of the far-field monitoring station locations and the 2013 sampling schedule is presented in Table 2-1. Sampling was conducted at the Bakers Falls station on a monthly basis throughout the dredging season. Rogers Island was sampled on a monthly basis from May through November. Three additional samples were collected from Rogers Island in June and July to investigate detectable PCB concentrations in samples collected from the background buoy location.

Lock 5 was sampled weekly as part of the off-season program and then daily for far-field compliance during dredging, which was initiated on April 29, 2013. Lock 5 continued as the far-field compliance monitoring location until May 14, 2013, when dredging started to occur within 1 mile upstream of the station. Weekly sampling continued at Lock 5 for informational purposes whenever the location was not used for near-field or far-field compliance. At the end of the dredging season, weekly off-season sampling resumed at Lock 5.

[3] This station was not used for far-field remediation monitoring in 2013. It was used on occasion for near-field monitoring in lieu of buoy-based monitoring when dredging was occurring close to that station.

The Stillwater manual station was sampled weekly during the first 2 weeks of May from the historical sampling station at the bridge in Stillwater. Four monitoring buoys were deployed at river mile (RM) 169.25, approximately 1 mile upstream of the Stillwater manual station. The Stillwater RM169.25 buoy transect was sampled daily for far-field compliance from May 14, 2013 through the end of dredging. The Stillwater manual station was sampled in place of the RM 169.25 buoy station from June 14 through 17, 2013; this was due to a high flow event that prevented safe access to the monitoring buoys. Sampling at Stillwater was discontinued at the end of the dredging season on November 8, 2013.

The automated station at Waterford was sampled as part of the off-season program until the start of dredging on April 28, 2013. Daily sampling was conducted for far-field compliance through November 11, 2013. The Waterford station was used for both near-field and far-field compliance between October 23 and November 4, 2013 when dredging occurred upstream in CU99.

Two monitoring buoys were deployed at RM153 on either side of the river near Green Island on October 14, 2013. The Green Island buoys were used for near-field and far-field compliance when dredging occurred in CU100. Three days of baseline sampling was conducted on October 15 through 17, 2013. During the baseline period, samples from each of the two buoys were submitted individually to assess any cross river variation in water quality. When dredging started in CU100 on October 30, 2013 and extending through November 15 (10 days after dredging was completed in CU100), the individual buoy samples were composited daily to generate a single compliance sample for the Green Island location.

The Lower Hudson River Albany location was routinely sampled monthly during 2013 as specified in the Phase 2 RAM QAPP. However, in response to elevated PCB concentrations measured at Waterford, additional samples were collected from the Albany station on June 27 and August 20. Additionally, prior to the initiation of dredging in CUs 99 and 100, 3 days of baseline sampling from the Albany station were conducted on October 15 through 17, 2013. Finally, when dredging occurred in CUs 99 and 100, daily manual sampling was conducted at the Albany station from October 30 through November 7, 2013. Data resulting from these final sampling events were used for informational purposes to inform the dredging operations.

The Lower Hudson River Poughkeepsie location was sampled monthly from April through November 2013 in accordance with the Phase 2 RAM QAPP.

2.1.2.2 Sample Collection Procedures

Far-field monitoring included collection of samples from a number of stations along the river using either manual or automated methods. Sampling at the far-field stations was conducted following procedures detailed in the Phase 2 RAM QAPP, as summarized below.

2.1.2.2.1 Manual Sampling

Manual sampling was performed during 2013 at Bakers Falls, Rogers Island, Stillwater manual station, Albany, and Poughkeepsie. At Bakers Falls, Stillwater, Albany, and Poughkeepsie, a variable-speed crane was used to lower a custom-designed multiple-aliquot-depth-integrating sampler (MADIS) through the water column to collect depth-integrated samples. Photographs of the boat-mounted crane and MADIS sampler are presented in Figures 2-3 and 2-4, respectively. At Rogers Island, due to the shallow water depth at this location, surface grab samples were collected by immersing sample containers directly into the river.

At Bakers Falls, depth-integrated samples were taken at the approximate centroid of the river cross-section from the downstream side of the Bakers Falls Bridge (County Route 27 Bridge). At Rogers Island, surface grab samples were collected at a point near the center of the channel upstream of all areas dredged since 2009, but downstream of the former Fort Edward Dam. The Bakers Falls and Rogers Island samples were collected on the same day that the monthly mGBM grab samples were collected from the background buoy (Section 2.1.2.2). The samples from these stations were submitted to the laboratory for analysis of PCBs by the mGBM and for TSS analysis. To satisfy the lower PCB analytical sensitivity requirements at these stations, 8 liters (L) of water were collected for each PCB sample from Bakers Falls and Rogers Island.

At the Stillwater manual station, depth-integrated samples were collected from four equal discharge increment (EDI) locations and a single equal volume aliquot composite sample was prepared and submitted to the laboratory for analyses of Aroclor PCBs and TSS. These

locations were upstream of the County Route 125 Bridge, to the west of the entrance to the Lock 4 land cut.

Lower Hudson River sampling at Albany and Poughkeepsie consisted of a single depth-integrated composite collected at the approximate centroid of the river. These samples were submitted to the laboratory for analyses of Aroclor PCBs and TSS.

2.1.2.2.2 Automated Sampling

The automated far-field monitoring stations located at Thompson Island, Lock 5, and Waterford collect water samples using pumps located on shore through piping that extends from a pump house into the river. At the Thompson Island and Lock 5 locations, the piping terminates in the river at pump intake structures that have been placed at locations that correspond to an EDI. The Waterford station piping terminates at a single point co-located with the water intake for the Town of Waterford. The pumping system at all locations supplies water to a stilling well in the pump house on a continuous basis. A refrigerated ISCO® sampler was programmed to collect aliquots at a 1-hour time interval to provide 24-hour composite samples. Samples from the Lock 5 far-field monitoring station were submitted to the laboratory daily from Sunday through Friday for analyses of Aroclor PCBs and TSS when the station was used for far-field compliance. The Lock 5 monitoring station was also used for near-field monitoring and informational purposes as detailed in Sections 2.1.1.1 and 2.1.1.3. Waterford station samples were submitted to the laboratory daily from Sunday through Friday for analyses of Aroclor PCBs and TSS; samples collected on Saturday were retrieved and submitted to the laboratory on Sunday.

The far-field compliance station at Stillwater consisted of four monitoring buoys deployed along a cross-river transect at RM169.25. The Green Island location consisted of two monitoring buoys deployed on either side of the river at RM153. Sample aliquots were collected from mid-depth in the water column at 1-hour intervals and composited over 24 hours. The samples from each transect station were then combined into a single, flow-proportioned composite and submitted to the laboratory daily from Sunday through Friday for analyses of Aroclor PCBs and TSS; samples collected on Saturday were retrieved and

submitted to the laboratory on Sunday. Flow proportioning was based on hydrographic data at the monitoring transect.

2.1.3 Spring High Flow Sampling

High flow water monitoring was conducted on April 21 and April 22, 2013. High flow samples were collected at the Lock 5 and Waterford automated sampling stations and submitted to the laboratory for Aroclor PCBs and TSS analyses. High flow conditions were defined as flows exceeding 15,000 cubic feet per second (cfs) at the U.S. Geologic Survey (USGS) gaging station at Fort Edward, New York (Station ID: 01327750). Due to equipment failure, grab samples were collected from the ISCO® sampler in place of the 6-hour composite samples prescribed in Section 2.5.3.2 of the Phase 2 RAM QAPP.

2.1.4 Off-season Water Column Monitoring

Off-season water monitoring was conducted from January 1 through April 25, 2013, in accordance with the Phase 2 RAM QAPP. The program was reinitiated upon completion of the far-field monitoring program on November 16, 2013, and followed sampling procedures outlined in the Phase 2 RAM QAPP. Off-season sampling was performed weekly at Thompson Island, Lock 5, and Waterford and monthly at Bakers Falls, Rogers Island, and the Lower Hudson River stations at Albany and Poughkeepsie (to the extent that weather and river conditions allowed). ISCO® samplers were used to collect 24-hour composites from the automated far-field stations.

Sample collection procedures for off-season monitoring were consistent with the far-field monitoring procedures (described in Section 2.1.2). Samples were submitted for analyses of PCBs by the mGBM and TSS at Rogers Island and Bakers Falls. For the remaining stations, samples were submitted to the laboratory for Aroclor PCBs and TSS analysis. Water quality data consisting of specific conductance, pH, temperature, turbidity, and dissolved oxygen concentration were collected continuously from the stilling wells within the Thompson Island, Lock 5, and Waterford far-field stations and at the time of sample collection for the remaining stations.

2.1.5 Analytical Program

The 2013 near-field, far-field, and off-season water analytical programs are summarized in Tables 2-2, 2-3, and 2-4, respectively. The analytical methods listed in these tables are described in detail in Attachment A of the Phase 2 RAM QAPP.

Aroclor PCB analysis was performed by Pace Analytical Services, Inc. (Pace) using Pace standard operating procedure (SOP) NE231_02 (Phase 2 RAM QAPP, Attachment A, Appendix A2-4). PCB analysis of water samples was also performed by Pace using the mGBM, as described in Appendices A2-5 and A2-6 of Attachment A of the Phase 2 RAM QAPP. The mGBM was optimized for the Phase 2 RAMP to include a second column (CP-SIL5-C18) analysis for the full resolution and individual measurement of certain dichlorobiphenyl congeners—International Union of Pure and Applied Chemistry (IUPAC) 4 and IUPAC 10—which coelute on the DB-1 column in the mGBM. Extraction and analysis techniques for PCBs in the Hudson River water were customized based on whether sampling stations require lower detection limit methods. The procedures employed were modifications to existing methods to improve sensitivity and/or to take advantage of current extraction technology. Brief descriptions of the extraction and analytical methods for routine samples (1-L for both mGBM analysis and Aroclor PCB analysis) and large-volume samples (approximately 8-L for mGBM analysis) are described in Section 2 of Attachment A of the Phase 2 RAM QAPP.

Pace also analyzed 1-L water samples for TSS following the standard EPA protocol (Standard Method 2540D) for the analysis of suspended sediment, with modifications consistent with the American Society for Testing and Materials (ASTM) D3977-97 Standard Test Methods for Determining Sediment Concentration in Water Samples, Test Method B – Filtration (Phase 2 RAM QAPP, Attachment A, Appendix A2-7).

Dissolved and total metals (Cd and Pb) were analyzed by EPA Method 200.8 (Phase 2 RAM QAPP, Attachment A, Appendix A2-8) by TestAmerica-Burlington. Samples were also analyzed for hardness by TestAmerica-Burlington using Standard Method 2340B (Phase 2 RAM QAPP, Attachment A, Appendix A2-11).

2.1.6 Water Quality Field Parameters

2.1.6.1 Near-field Buoys

Real-time water quality data consisting of specific conductance, pH, temperature, turbidity, and dissolved oxygen concentration were collected continuously from the near-field buoys when they were in operation. The buoys were equipped with automated samplers, multi-parameter water quality sondes, data logging systems, and data transmission capabilities. The water quality sondes were deployed at approximately 50% of the water column depth. Water quality data transmitted to a project environmental data management system (eDMS) at approximately 15-minute intervals.[4]

Data collected by the sonde probes were verified using an automatic system built into the eDMS. The system compared the probe-measured data to established ranges and acceptable drift criteria. In the event that the data fell outside of the acceptable ranges or exceeded acceptable drift, the data were qualified appropriately, and descriptive notes were entered by field personnel.

2.1.6.2 Manual Sampling Locations

Water quality measurements were taken in conjunction with manual sampling activities. Instantaneous surface water quality measurements were taken at mid-depth in the water column at each EDI or single point location at the time of sample collection. These measurements included temperature, specific conductivity, pH, DO, and turbidity using a sonde. The manual water quality measurements were uploaded to the project eDMS at the end of each sampling day.

2.1.6.3 Automated Stations

Real-time water quality data were collected continuously at the Thompson Island, Lock 5, and Waterford far-field automated stations. Water quality parameters consisting of DO, conductivity, temperature, pH, and turbidity measurements were collected and transmitted to the project eDMS at 15-minute intervals.

[4] A detailed explanation of the eDMS is presented in Section 10.5 of the Phase 2 RAM QAPP.

2.2 Downstream Sediment Special Study

During the 2013 season, GE continued the ongoing surface sediment special study, described in Section 9.3 of the Phase 2 RAM QAPP, to: 1) measure the baseline PCB concentrations in surface sediments within and downstream of Phase 2 dredge areas; and 2) assess the spatial extent, concentration, and mass of PCBs deposited on surface sediments downstream of dredge areas as a result of dredging. This study was initiated by EPA in 2010 and continued by GE in subsequent years. As part of this study, downstream surface sediment sampling was completed in River Sections 1 and 2 in 2011 and 2012, respectively. In 2013, surface sediment sampling was performed in River Section 3 at Sediment Sampling and Analysis Program locations where a 0- to 2-inch surface segment was previously analyzed.

The original EPA study design included collection of 113 surface sediment samples and 6 duplicates from River Section 1, 114 surface sediment samples and 6 duplicates from River Section 2, and 130 surface sediment samples and 6 duplicates from River Section 3, as specified in the EPA QAPP (SERAS 2010). GE, with EPA approval, added 54 additional locations to the target list provided by EPA for River Section 3. The purpose of the additional samples was to provide more representative composite samples as described below.

GE and EPA agreed to modify the sampling locations and procedures for River Section 2, as described in the Phase 2 RAM QAPP (Section 9.3). In 2013, samples were collected in River Section 3 using an approach that was similar to the procedure followed for River Section 2 in 2012. The compositing approach for River Section 3 was presented to EPA on August 8, 2013. A portion of the sample locations used to form the composites were reconfigured in response to EPA's request prior to collection of the samples. The composites were formed based on sediment type and proximity using the following approach:

- Locations within the same CU and sediment type (according to the side-scan sonar data) were to be composited.
- Locations outside of dredge areas within 0.5 mile proximity and within the same sediment type were to be composited.
- The number of locations in each composite sample would range from one to four.

The basis for this approach was to minimize the variability that sample location and sediment type have on PCB concentrations.

This special study targeted 184 locations in River Section 3 for sediment PCB sampling in 2013. Surface sediment sampling activities associated with this study were conducted from August 19 to August 29, 2013, and followed the compositing approach described above. It was not possible to collect samples at a subset of the targeted locations due to a lack of sediment (30 locations) or the inaccessibility of targeted locations (19 locations). This sampling resulted in a total of 74 individual and composite samples that were submitted for analysis.

The surface sediment samples collected were analyzed for the following chemical and geotechnical parameters, using the methods described in Section 4 of Attachment A of the Phase 2 RAM QAPP:

- Aroclor PCBs analysis by the GEHR8082 method (Phase 2 RAM QAPP, Attachment A, Appendix A4-1
- TOC by the Lloyd Kahn method (Phase 2 RAM QAPP, Attachment A, Appendix A6-1)
- Moisture content (in extraction SOPs in Phase 2 RAM QAPP, Attachment A, Appendices A4-3 through A4-5)
- Grain size by ASTM D422 (Phase 2 RAM QAPP, Attachment A, Appendix A6-2).

The results of the sediment sampling conducted as part of this special study are presented in Section 4.5.1.

2.3 2013 Fish Sampling Program

The fish monitoring program continued in 2013 in accordance with Section 3 of the Phase 2 RAM QAPP. Adult fish were sampled in the spring, and yearling pumpkinseed and forage fish were sampled in the late summer. Fish collection was targeted within the following four pools of the Upper Hudson River and three locations in the Lower Hudson River:

- Feeder Dam Pool (one station)

- Thompson Island Pool (five stations: TD1 through TD5)
- Northumberland Pool (four stations: ND 1, ND2, ND3, and ND5)
- Stillwater Pool (five stations: SW1 through SW5)
- Albany/Troy (one station; below Federal Dam in the spring and Albany Corning Preserve in the late summer)
- Catskill (one station; spring only)
- Tappan Zee (one station; spring only)

The spring and late summer fish sampling transect locations are depicted in Figures 2-5 and 2-6, respectively.

2.3.1 Spring Sampling

Spring fish sampling occurred on April 15, April 16, April 17, May 6, May 7, May 28 through June 5, June 26, and June 27, 2013 (Table 2-5). During sampling, adult species of black bass (largemouth bass and smallmouth bass), perch (yellow perch and white perch), and ictalurids (brown bullhead, yellow bullhead, and channel catfish) were targeted from the 15 stations in the Upper Hudson River. The Lower Hudson River locations were sampled for black bass and ictalurids (Albany/Troy and Catskill stations), perch (Albany/Troy), and striped bass (Albany/Troy, Catskill, and Tappan Zee stations). A total of 483 samples were collected (Table 2-5) from the spring sampling locations (Figures 2-5a through 2-5k); 472 samples were submitted to the laboratory for analyses of Aroclor PCBs and 11 extra samples were archived at the laboratory. The samples submitted to the laboratory included 145 samples from the black bass group, 145 from the bullhead group, 125 from the perch group, and 57 striped bass. Additional samples were collected at some stations to make up for a lack of fish at other stations within the same pool. Collections of adult fish targeted the legal or edible total lengths as follows:

- Black bass: 305 millimeter (mm) or larger
- Bullhead/catfish: 200 mm or larger
- Yellow perch: 170 mm or larger
- White perch: 160 mm or larger
- Striped bass: 457 mm or larger

A total of 20 individuals per species were collected from the Feeder Dam Pool and from each of the Albany/Troy and Catskill stations.

In the Thompson Island Pool, 30 individuals per species were targeted, with five individuals per species from TD1, TD2, TD3, and TD4, and ten individuals per species from TD5 (the historical location behind Griffin Island).[5] The targeted numbers of each species were collected from all but the TD4 station where only three yellow perch were collected. Therefore, two additional yellow perch collected from TD5 were used to replace those targeted but not collected from TD4, to bring the Thompson Island Pool total number of fish sampled to 30 individuals of each species.

In the Northumberland Pool, 25 individuals per species were collected (5 each at locations ND1 through ND3 and 10 at location ND5). Location ND4 was abandoned after the first year of the BMP due to lack of fish and habitat, hence, 5 additional individuals per species were collected from ND5 to compensate.

In the Stillwater Pool, 30 individuals per species were targeted. Five individuals per species were collected from SW1 and SW2. At SW3, ten individuals were collected for each species. At SW4, 5 individuals each were collected of bass and yellow perch and 11 bullhead were collected to make up for the lack of fish at the other stations. However, subsequent sampling yielded targeted numbers and the extra fish were archived. At SW5, five individuals per species were collected.

At the Tappan Zee station, 17 of the targeted 20 striped bass were collected.

2.3.2 Late Summer Sampling

Forage fish and yearling pumpkinseed were collected on August 13, from September 3 through September 5, and on September 17, 2013, from the Upper Hudson River locations and the Albany/Troy location (Figures 2-6a through 2-6i). A total of 162 samples were

[5] Extra fish were collected at TD5 and TD3 to make up for potential lack of fish at TD1, TD2, and TD4. At TD5 two extra bullhead and four extra yellow perch were collected, and at TD3 one extra bass was collected.

collected from all locations (Table 2-6). Forage fish were collected as whole-body composites and included spottail shiner, fallfish, mimic shiner, spotfin shiner, and golden shiner (one species per composite); species collected were dependent on availability. One composite collected at the Albany/Troy location was unable to be identified in the field and therefore was labeled minnow species in the field database. A total of 50 forage fish composites were targeted from the late-summer sampling locations (10 composites per pool; Table 2-6). Yearling pumpkinseeds were captured from each pool and submitted as whole-body individual samples. Pumpkinseeds were considered yearlings if they were between 70 and 130 mm total length in accordance with the requirements in Section 3.5.1 of the Phase 2 RAM QAPP.

In the Feeder Dam Pool, 20 yearling pumpkinseeds and ten forage fish composites were collected.

In the Thompson Island Pool, 30 yearling pumpkinseeds were collected, with 10 individuals from the historical location across from Griffin Island (TD5) and 5 individuals each from the four other Thompson Island Pool stations. Ten forage fish composites were collected, with two composites coming from each station.

In the Northumberland Pool, 25 yearling pumpkinseeds were collected, with 10 individuals collected from ND5 and 5 individuals each from the other stations. Ten forage fish composites were collected, with two composites each from stations ND1, ND2, and ND3 and four composites from ND5.

In the Stillwater Pool, 30 yearling pumpkinseeds were collected, with 10 individuals from the historical location at Stillwater (SW5) and 5 individuals each from the four remaining stations (SW1, SW2, SW3, and SW4). Two forage fish composites were collected at each station within the pool.

At the Albany/Troy location, 11 yearling pumpkinseed and 6 forage fish composites were collected.

2.3.3 Sampling Methods

Electroshocking and angling were used to collect targeted species. Samples of the edible portions for human and wildlife consumers of fish were prepared as follows:

- Fillets for black bass, ictalurids, perch, and striped bass
- Individual whole-body samples for pumpkinseed
- Whole-body composites for spottail shiners and other forage fish species

Electrofishing was accomplished with an 18-foot boat equipped with a variable output gas-powered DC generator. Operating amperage was adjusted according to water conductivity to minimize injury to fish. Stunned fish were immediately removed from the electrical field using dip nets to minimize the duration of the shock. Striped bass were captured by angling at Tappan Zee due to the higher water conductivity in this area which limits electrofishing effectiveness and to avoid the incidental capture of shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*A. oxyrinchus oxyrinchus*). Fish were held in live-wells or buckets with frequent water changes during collection or placed on ice. Fish were sacrificed by a blow to the head or by cervical dislocation.

Sampling methods were consistent with procedures outlined in Section 3 of the Phase 2 RAM QAPP. Adult fish were collected along transects at each station during spring 2013. Transects were approximately 200 to 2,000 m in length and were located parallel to the shoreline in water approximately 1 to 3 m deep (Figures 2-5a through 2-5k).

Fish collected in the late summer were generally collected along the same transects sampled in the spring (Figures 2-6a through 2-6i). Late summer transects at a few stations were in slightly different areas than adult fish locations consistent with historical New York State Department of Environmental Conservation (NYSDEC), BMP, and Phase 1 RAMP sampling locations. Transects were approximately 200 to 1,000 m in length and were located parallel to the shoreline in water approximately 1 to 3 m deep (Figures 2-6a through 2-6i). Fish were handled according to standard procedures developed by NYSDEC (2000), and utilized during the BMP and specified in the Phase 2 RAM QAPP. At the Albany/Troy location, several yearling pumpkinseed were collected from the western shoreline between the Dunn Memorial Bridge and the Corning Preserve boat launch.

For each specimen, the following were recorded in the RAMP fish database:

- The date of collection
- A unique identification number or code
- The station location (including coordinates)
- Genus and species
- Total length in mm (to nearest mm)
- Weight in grams (to nearest gram for adult fish and 0.1 grams for yearling pumpkinseed and forage fish)
- Sex (determined in the analytical laboratory during processing)
- Method of collection

Measurements were made as soon as possible following collection, using calibrated instruments. Each sample was then wrapped in clean aluminum foil (shiny side out), placed in a labeled plastic resealable storage bag, and kept on ice following data processing. The same information was collected for composited fish, including number of individuals within the composite. Obvious external abnormalities were noted in the database. Chain-of-custody (COC) forms were generated after data were entered into the database and samples were kept on ice and delivered by courier to the Pace laboratory in Schenectady, New York for analysis. Samples were processed by experienced personnel at the laboratory, and prepared tissues (standard fillets or whole bodies) were frozen at a temperature below -18 degrees Celsius (°C) until analyzed. Fish samples were analyzed within the 1-year holding time.

2.3.4 Analytical Program

Fish preparation (filleting, scaling, skin removal from ictalurids, and sex determination) was conducted by Pace according to the methods outlined in Pace SOP NE158-05-01 (Phase 2 RAM QAPP, Attachment A, Appendix A3-3). Fish samples were analyzed by Pace for Total PCBs according to a modification of the SW-846 Method 8082/8082A Aroclor Sum Method (Pace SOP NE148_08; Phase 2 RAM QAPP, Attachment A, Appendix A3-1).

Additionally, fish samples were analyzed by Pace to determine the lipid contents according to the methods outlined in Pace SOP NE158_05 (Phase 2 RAM QAPP, Attachment A,

Appendix A3-3). Analysis by the mGBM (Pace SOP NE013_10; Phase 2 RAM QAPP, Attachment A, Appendix A3-2) was performed by Pace on 5% of the total number of fish samples.

Prior to analysis, fish tissue, either whole body or fillet, was homogenized following the methods outlined in Pace SOP NE132_07 (Phase 2 RAM QAPP, Attachment A, Appendix A3-4). Extraction and cleanup of fish tissue were accomplished via Pace SOP NE017_09 (Phase 2 RAM QAPP, Attachment A, Appendix A3-5).

3 QUALITY ASSURANCE/QUALITY CONTROL

3.1 Performance Evaluation Samples

3.1.1 Aqueous Performance Evaluation Samples

GE submitted performance evaluation (PE) samples to Pace for both the 1-L and 8-L mGBM analyses of water samples in July 2013. The PE samples were prepared by Phenova (formerly Wibby Environmental) and contained the same 64 congeners contained in the PE samples used in the independent verification of the mGBM validation at concentrations near the current laboratory control spike (LCS) levels of 198 nanograms per liter (ng/L) and 6 ng/L for the 1-L and 8-L mGBM analyses, respectively. The 64 congeners are representative of those typically encountered in Hudson River environmental samples. The laboratory summed the individual congener results on a homolog and total basis. An evaluation of the method performance was made based on acceptance limits of 70% to 130% for the individual IUPAC 4 and IUPAC 10 congeners, homolog, and Total PCB results as compared to the known values. Recoveries for the homologs and Total PCBs in both the 1-L and 8-L mGBM PE samples were within the 70% to 130% acceptance limits with the exception of slightly low recoveries for monochlorobiphenyl in both the 8-L and the 1-L mGBM PEs (59% and 69%, respectively, as shown in Table 3-1). In addition, the recoveries for BZ 4 and BZ 10 in both the 1-L and 8-L mGBM PE samples were within the 70% to 130% acceptance limits (Table 3-2).

Several evaluations were made to investigate the low monochlorobiphenyl recovery in the 1-L mGBM PE, with the following results:

- The initial calibration results suggest very good instrument linearity with a correlation coefficient of 0.9997 for peak 2 (the only monochlorobiphenyl spiked in the mGBM PEs).
- The bracketing continuing calibration verification (CCV) results suggest good instrument stability with percent differences of approximately 2% for both total PCBs and peak 2.
- The PE preparation log provided by Phenova does not reveal a documented spiking error.

The investigation did not reveal any laboratory error or documented spiking error during PE preparation that would result in low monochlorobiphenyl recoveries. The CCVs showed good stability for both total PCBs and peak 2. It is possible that monochlorobiphenyl was lost during the PE sample extractions. The results of the 2013 PEs were similar to those for the 2011 and 2012 PEs, which may indicate that the limits are too tight for monochlorobiphenyl given the greater likelihood of loss due to volatilization for this PCB congener. In this situation, no corrective action is required.

3.1.2 Sediment Performance Evaluation Samples

The preparation of sediment PEs, generation of control limits, and implementation of the 2013 sediment PE program associated with the downstream sediment special study were performed as described in the Phase 2 RAM QAPP. The PEs used and submitted during analysis of the sediment samples collected as part of this special study are listed in Table 3-3. PE25 and PE26 were each provided to the field team for submittal to the laboratory for this study. The control charts for the GEHR8082 Total PCB PE results associated with this special study in 2013 indicate that Pace remained in control (Figure 3-1). Specifically, the Total PCB results for the special study GEHR8082 PEs were within plus or minus two standard deviations of the mean, demonstrating that the results are accurate and comparable. Control charts for Aroclor 1221 (Figure 3-2) and Aroclor 1242 (Figure 3-3) also indicate that Pace accurately determined the individual Aroclor concentrations.

3.2 Field Quality Assurance/Quality Control

Field quality assurance/quality control (QA/QC) samples were collected to allow evaluation of data quality. Field QA/QC samples for water column samples included equipment blank samples, blind duplicate samples, and matrix spike (MS) samples. Field QA/QC for sediment samples collected as part of the special study consisted of blind duplicate samples. Fish sampling field QA/QC samples were generated in the laboratory because fish sampling does not include the use of field QA/QC samples as part of the study design. The types and frequency of field QA/QC checks and samples collected for each parameter are described below.

3.2.1 Remedial Action Monitoring Program Sampling

3.2.1.1 Far-field Station Quality Assurance/Quality Control Sampling

Far-field station QA/QC testing was conducted in 2013 in accordance with the Phase 2 RAM QAPP. The sampling was conducted on a monthly basis from May through November 2013 to evaluate the performance of the automated far-field monitoring stations in use for each month. The sampling was conducted at the Lock 5, Stillwater, and Waterford stations. Additionally, one round of QA/QC sampling was conducted at the Thompson Island Dam station before it was used for off-season monitoring. Both the manual and automated samples were collected in duplicate, and submitted for analysis of PCBs by the mGBM and for TSS analysis. The QA/QC sampling included the collection of manual samples from each intake location using procedures described in Section 2.1.2.2.1. Manual samples from Stillwater were collected alongside the monitoring buoys and automated samples were collected from the ISCO® sampler. Samples from the automated stations were collected from the stilling well using the ISCO® sampler. The results of this QA/QC testing are summarized in Table 3-4.

3.2.1.2 Water Sampling Instrument Calibration

Continuous water quality measurements for temperature, specific conductivity, pH, DO, and turbidity were performed at both the near-field and far-field monitoring stations throughout the 2013 dredging season. These measurements were made using a YSI 6920 multi-parameter probe. The probe was calibrated in accordance with the manufacturer's recommendations prior to deployment. Once the probe was installed at a monitoring station, the instrument calibration was checked by deploying a second calibrated instrument at the same approximate location (in the water column for buoy-based stations or stilling well for automated far-field stations) and performing an instantaneous comparison of the outputs. If the data were outside of the acceptable range (as specified in Appendix 2.3-3 of the Phase 2 RAM QAPP), the probe was re-calibrated or replaced with a calibrated instrument, as appropriate. The Phase 2 RAM QAPP specifies that the calibration checks described above are to be conducted once per week; however, these checks were performed at a reduced frequency during 2013. Field staff substituted daily observations of the real-time water quality values with identification of anomalous values for the weekly field checks. Identified anomalous values were evaluated further in the field. The lack of weekly

checks was identified during the fall ESI field audit, and corrective actions were instituted to resume conducting the weekly checks in accordance with the Phase 2 RAM QAPP.

3.2.1.3 Fish Sampling Instrument Calibration

Balances used to weigh fish were calibrated each day prior to sampling. Calibration checks were recorded on a field log. A YSI 6920 WQ probe was used at each station. This probe was calibrated prior to use in accordance with the user manual. Equipment was maintained and repaired in accordance with manufacturer's specifications. In addition, prior to use, each major piece of equipment was cleaned, decontaminated, checked for damage, and repaired if needed. Field calibration activities were noted in a field log notebook or form.

3.2.1.4 Equipment Blanks

Equipment blanks were collected for PCB (Aroclor and/or mGBM) analysis once per group of up to 20 water samples obtained using manual sampling techniques at the far-field sampling stations (i.e., collected approximately monthly throughout the dredging season). Equipment blanks (i.e., filter blanks) were also collected weekly for analysis of dissolved metals (during the sampling period for metals), which met the Phase 2 RAM QAPP's required frequency of one per sample batch of up to 20 samples (i.e., rate of 5%). Equipment blanks were collected at the rate of 5% of the total number of sediment samples or one per sample batch of up to 20 samples for the sediment special study programs. With the exception of filter blanks for dissolved metals, equipment blanks in association with water samples were not collected using dedicated automated sampling equipment at near-field and far-field stations. Specifically, equipment blanks for water sampling were collected using a representative clean, individual sample container used for sub-sample collection in accordance with the water column sample collection SOPs (Appendices 2.3-1, 2.3-2, and 2.4-1 of the Phase 2 RAM QAPP). Equipment blanks were not applicable to the TSS analysis.

Equipment blanks for fish tissue samples were not required in the approved Phase 2 RAM QAPP.

Equipment blanks for sediment samples analyzed for PCBs were prepared by processing a sample of clean, pre-tested sand in the same manner as environmental samples, including placement in sampling equipment, removal, mixing, and placing in containers.

3.2.1.5 Field Duplicates

Sample duplicates were collected in the field (co-located with the environmental sample) following sampling procedures detailed in the water column sample collection SOP (Appendices 2.3-1 and 2.4-1 of the Phase 2 RAM QAPP). These samples were submitted to the analytical laboratory "blind" without any indication of the actual sample location. Field duplicates were generally prepared at a rate of 5% or greater of the total number of environmental samples (at least one duplicate sample per batch of 20 samples) as specified in the Phase 2 RAM QAPP. Sediment field duplicates were prepared at the rate of 5% or greater of the total number of environmental samples, and consisted of two aliquots of homogenized sediment. Because it is impossible to collect field duplicates for fish samples, duplicates for fish were generated in the laboratory by splitting the homogenate.

3.2.1.6 Laboratory Duplicates/Matrix Spikes/Matrix Spike Duplicates

The water program included analysis of MS samples for metals at a rate of one per sample batch (up to 20 samples), and analysis of laboratory duplicate (LD) samples for metals and TSS at a rate of one per sample batch (up to 20 samples). Some of the sample batches for TSS did not include the required LD, but an overall rate of 5% was met. The water sampling program also included the analysis of MS samples for whole water PCBs (Aroclor and mGBM) at a minimum rate of 5% of the total number of environmental samples, as required by the Phase 2 RAM QAPP. In addition, the water program included the analysis of four matrix spike duplicates (MSDs) for PCBs by mGBM and eight MSDs for Aroclor PCBs, as compared to the Phase 2 RAM QAPP-required rate of one MSD per month.

MS/MSDs/LDs were analyzed at the rate of one pair per sample batch (up to 20 samples) for fish samples. Either MSD or LD analysis was performed on fish samples, but not both.

MSs, LDs, and/or MSDs were not required for the Aroclor PCB analysis on sediment samples (consistent with the Sediment Sampling and Analysis Plan, Phase 1 RAMP, and Phase 2

RAMP in 2001 and 2012) because the sediment QC program used PE samples extensively as an accuracy monitoring measure, as described in Section 3.1.2. MSs and LDs for sediment samples were analyzed for TOC at a rate of 5% of the total number of environmental samples as required by the Phase 2 RAM QAPP. LDs for sediment samples were analyzed for moisture content at a rate of 5% of the total number of environmental samples, as required by the Phase 2 RAM QAPP.

3.3 Lab Quality Assurance/Quality Control

3.3.1 Method Blanks

Method blanks were prepared and analyzed by the contract laboratories at a rate of at least one per analytical batch. Method blanks for water consisted of laboratory-prepared blank water that was processed along with the batch of environmental samples, including all treatments performed on actual samples. Method blanks for sediment and fish consisted of sodium sulfate that was processed along with the batch of environmental samples, including all treatments performed on actual samples.

3.3.2 Laboratory Control Spikes

LCSs were analyzed at the rate of one per sample batch (up to 20 samples). LCSs consisted of laboratory-fortified method blanks. The purpose of analyzing laboratory control samples is to demonstrate the accuracy of the analytical method.

3.3.3 Temperature Blanks

A temperature blank was provided in each cooler sent from the laboratory to the field. The purpose of this sample was to document the temperature of the cooler upon arrival at the laboratory.

3.4 Environmental Protection Agency Split Samples

EPA did not collect split water or sediment samples during 2013. EPA has not obtained split homogenized fish tissue samples from the 2013 samples as of the date of this report.

3.5 Field and Laboratory Audits

Field audits of the near-field and far-field water column collection activities performed by Anchor QEA field personnel were conducted by ESI on May 6 and 8, 2013, and October 17, 2013. A field audit of 2013 fish collection activities performed by Anchor QEA field personnel was conducted by ESI on September 17, 2013. These audits were conducted as described in Section 11.1.2 of the Phase 2 RAM QAPP. The field audits indicated that the field crews conducted their work in a professional manner and complied with the procedures outlined in the Phase 2 RAM QAPP and applicable SOPs. Additionally, the field audits indicated that consistent sample collection and processing procedures were used during 2013. A few minor issues were identified during the audits and are discussed in the audit reports (Appendix B). The issues identified in the audit reports did not jeopardize the data quality objectives (DQOs) of the project. When possible, the recommendations were discussed with the field team at the time of occurrence. A debriefing meeting was held with Anchor QEA field personnel at the conclusion of each audit. The field crews incorporated recommendations, as appropriate.

Laboratory audits were conducted by ESI personnel on May 2 and 3, 2013 for Pace (with respect to PCB and TSS analyses for water samples); on May 16 and 17, 2013 for Pace (with respect to PCB and TOC analyses for sediment samples); and on May 15, 2013 for TestAmerica Burlington (with respect to metals and hardness analyses for water). The audits were conducted as described in Section 11.2.3 of the Phase 2 RAM QAPP and intended to provide feedback on laboratory operating issues with respect to method compliance, laboratory systems, and good laboratory practices.

The audit reports for the contract laboratories are included in Appendix B. The audits found that the laboratories were adhering to the project-specific methods and QA requirements.

3.6 Discontinuation of mGBM Bias Correction Factors

Throughout the BMP and Phase 1 water monitoring programs, correction factors were applied by Pace to the mGBM results to more accurately report the concentrations for IUPAC 4 and IUPAC 10 in DB-1 Peak 5, IUPAC 5 and IUPAC 8 in DB-1 Peak 8, and IUPAC 15 and IUPAC 18 in DB-1 Peak 14. The correction factors for DB-1 Peaks 5, 8, and

14 had been determined in 2003 for the BMP and in 2009 for the Phase 1 RAMP using the approach described in Development of Corrections for Analytical Biases in the 1991 to 1997 GE Hudson River PCB Database (HydroQual 1997). However, as directed by EPA, these correction factors were no longer used in the Phase 2 RAMP. Instead, the mGBM was updated to include a second column (CP-SIL5-C18) analysis for the dichlorobiphenyl congeners IUPAC 4 and IUPAC 10. The second column analysis was used for water samples analyzed by the mGBM to achieve a more accurate quantification for PCB congeners IUPAC 4 and IUPAC 10 (which coelute in mGBM Peak 5) by achieving full resolution and individual measurement for these two congeners. Correction factors were also no longer utilized for mGBM DB-1 Peaks 8 and 14 due to their relatively minor contribution to Total PCBs.

3.7 Data Management

Data collected under the water and fish sampling programs have been stored in electronic databases. Specialized application modules, outlined in the subsections below, were used to automate data collection, data evaluation, and data integration.

3.7.1 Field Sample Data Collection System

The water monitoring programs consisted of collecting both field data from recording instruments and water samples for laboratory analysis. Field data and sample collection information were captured electronically in a field database designed to support the monitoring program. The field database application comprised electronic data entry forms and data export functions designed to ensure efficient and accurate data recording. Features included data entry fields with valid value selection lists to limit entry errors and automated data generation for field values based on user-entered information to limit transcription errors. Functions also included sample label and COC form generation capabilities for samples that were sent to laboratories for analysis. Further, these applications had procedures for electronic data deliverable (EDD) generation from field databases to facilitate accurate data import into the central RAMP database.

Probe-based water quality data collected from near- and far-field monitoring stations were recorded on data loggers and transmitted in real-time to the RAMP eDMS. Each station

recorded temperature, turbidity, DO, specific conductivity, pH, geographic position, and battery voltage. Continuously monitored data received from the monitoring stations by the data management system were automatically checked for valid values before being stored in the eDMS database. If any of these data did not pass these checks, an error log was generated for review by designated data QC personnel.

For the fish sampling program, field-generated data were entered into a field database via custom-designed forms developed in Microsoft® Access. This custom application facilitated data entry and management of the collected field data for the project by capturing, managing, and maintaining field data, including electronic COC creation, sample identification creation, and sample label creation. These forms also limited the possibility of data entry/transcription errors by including valid value selection lists for certain required fields. In addition, several data fields were populated automatically to further reduce data entry/transcription errors.

3.7.2 Laboratory Data Checker

Custom computer code was written to automate checking of the EDDs submitted by the analytical laboratory. EDDs submitted to the data management system were automatically checked for data reliability according to various criteria, including valid values, data types, and format, as described in the Phase 2 RAM QAPP. If errors were detected, the file was corrected by the laboratory prior to loading into the data management system.

3.7.3 Data Verification Module

Custom computer code was developed to facilitate data quality evaluation. An automated data verification module (DVM) verified analytical data submitted by the laboratory, reviewed data against the performance specifications provided for the project, produced exception reports, and loaded qualified results to the project database.

The term "verification" is used to designate the criteria-based checking of the laboratory-reported QC results against the limits defined in the Phase 2 RAM QAPP. This comparison was used to qualify the data, as necessary. Automated electronic data verification (EDV) was performed on 100% of the analytical results received using the batch QC results provided by

the laboratories in the EDDs. The following specific measures were evaluated during verification and the associated criteria and are discussed in the Phase 2 RAM QAPP:

- Holding times
- Accuracy (by evaluating LCS and MS/MSD recoveries)
- Precision (by evaluating LD results)
- Field duplicate sample precision
- Blank contamination (laboratory method blanks and field generated blanks)
- Surrogate compound recoveries
- Percent solids

3.8 Data Validation

EDV and data validation (where necessary) were conducted after samples were collected and analyzed. The usability of the analytical data was assessed using a tiered approach. All data initially underwent EDV, which provided the first test of the quality of the results. This automated process assessed data usability by evaluating batch QC results. As noted above, the term "verification" is used because criteria-based checking of the laboratory reported QC results against the limits defined in the Phase 2 RAM QAPP was used to qualify data.

Full validation (i.e., manual qualitative and quantitative checking) included an evaluation of documented QA/QC measures through a review of tabulated QC summary forms and raw instrument data. The validation results were also compared to the results of the electronic verification for the same set of data, which provided an indication of the accuracy of the electronic verification process. Verification and validation findings are discussed in Section 5.

3.8.1 Remedial Action Monitoring Program Water Data

Section 12.2.2.2.1 of the Phase 2 RAM QAPP specifies that all data for the water column samples collected for PCBs (Aroclor and mGBM), metals, hardness, and TSS during the first week of dredging were to undergo full manual validation to provide a measure of data quality at the startup of the dredging season. In addition, that section states that approximately 50% of the data for the aforementioned analyses from the water column samples collected during the third week of the dredging season would undergo manual

validation to provide a measure of data quality at the beginning of the season once the laboratories were in full operation and past any startup issues. Finally, that section provides that, starting with data collected during the fourth week of the dredging season, approximately 5% of the data for the aforementioned analyses would be validated each month to provide an ongoing measure of data quality throughout the dredging season.

As discussed in Phase 2 CAM 1, dated November 30, 2012 (Anchor QEA and ESI 2013b, Appendix C), the manual data validation performed in 2011 did not reveal start-up issues and Pace and TestAmerica Burlington have been used for the Phase 2 RAMP since the 2011 season. Therefore, it was concluded that on-going extra front-loaded data validation would not provide a significant benefit to the Phase 2 RAMP. As a result, with EPA approval, the up-front validation of early season data was discontinued starting in 2012 and 5% of the 2013 PCB data generated were validated to provide an ongoing measure of data quality. The overall percentage of data validated for the Phase 2 RAMP data included in this DSR for each analytical technique is presented in Table 3-5.

3.8.2 Special Study Sediment Data

Approximately 5% of all sediment data analyzed for Aroclor PCBs for the dredging project in 2013 and the first two sample delivery groups (SDGs) of TOC samples were validated to provide an ongoing measure of data quality during the dredging season, including the special studies. As indicated in Table 3-5, no sediment samples from the downstream sediment special study were selected for manual data validation. However, the 5% validation goal was met for the Aroclor PCB analysis for all the sediment programs combined (i.e., the residual sediment sampling, backfill/capping sampling, and the special study described in the Phase 2 RAM QAPP). The first two SDGs of TOC data, which require validation as per the Phase 2 RAM QAPP, were associated with the backfill/capping sampling program and not with the downstream sediment special study. Percent moisture and grain size data were not validated, as stated in the Phase 2 RAM QAPP.

3.8.3 Fish Tissue Data

Full data validation was performed on 5% of the PCB data (Aroclor PCBs) from fish tissue samples, as presented in Table 3-5. One of the first SDGs provided for the year was selected

for validation in order to identify potential issues at the beginning of the season. Subsequent SDGs were selected randomly until the annual 5% validation goal was met.

3.9 Sample Archives

2013 RAMP sample extracts for PCB analysis and homogenized tissue from fish samples were held (frozen at less than -10 °C for extracts and less than -18 °C for fish tissue) as required by Section 10.1.3 of the Phase 2 RAM QAPP as follows:

Sample/PCB Extract Matrix	Archive Time
Water Sample Extract	Until holding time is exceeded
Homogenized Fish Tissue	1 year from collection
Fish Tissue Extract	1 year from collection

EPA will have the option of obtaining some or all of the 2013 archived sample extracts and homogenized fish tissue pursuant to the 2005 Remedial Action Consent Decree (RA CD) for this site.

4 RESULTS

4.1 Near-field Water Results

4.1.1 Polychlorinated Biphenyls

A total of 721 environmental samples (667 environmental samples plus 54 duplicates) were analyzed for Aroclor PCBs. The results ranged from non-detect to 1,762 ng/L. Six environmental samples collected from the background location were analyzed for PCBs by the mGBM; results ranged from 6 to 18 ng/L. Summary statistics by station are presented in Table 4-1. The near-field PCB data are included in the database provided in Appendix C.

4.1.2 Metals and Hardness

Samples collected for analysis of dissolved and total metals and hardness were collected from the near-field transect for the first 4 weeks (approximately) of dredging activities. Three additional samples were collected when dredging was occurring in areas with higher sediment metals concentrations. Seven environmental samples and one duplicate were analyzed for total and dissolved Cd and Pb and for hardness. In accordance with the Phase 2 RAM QAPP, sampling for metals and hardness was discontinued after that initial period because results were significantly below the Aquatic Acute water quality Standards (as specified in Section 2.3.3 of the Phase 2 RAM QAPP). Summary statistics of the total and dissolved metals data are presented in Table 4-2, and the data are included in Appendix C.

4.1.3 Total Suspended Solids

A total of 723 samples (671 environmental samples plus 52 duplicates) were analyzed for TSS. Results ranged from non-detect to 108 mg/L. Summary statistics are presented in Table 4-1, and the data are included in Appendix C.

4.1.4 Water Quality Parameters

Summary statistics of the near-field DO, turbidity, and pH measurements are presented in Table 4-3. Near-field water quality data are included in Appendix D.

4.2 Far-field Water Results

4.2.1 Polychlorinated Biphenyls

A total of 519 routine samples (481 environmental samples plus 38 duplicates) were collected during the 2013 dredging season. Sixteen environmental samples, collected at Bakers Falls and Rogers Island, were analyzed for PCBs by the mGBM; and a total of 478 samples (465 environmental and 38 duplicates) were analyzed for Aroclor PCBs. PCB results for far-field compliance stations ranged from non-detect to 568 ng/L. Additionally, 25 samples (24 environmental and 1 duplicate) were collected from the Lock 5 far-field station when data from this station were obtained for informational purposes (i.e., not compared to performance standard criteria due to the close proximity of dredging operations). These informational samples were analyzed for Aroclor PCBs and concentrations ranged from non-detect to 879 ng/L. Summary statistics for samples by station are presented in Table 4-4, and the data are included in the database provided in Appendix C.

4.2.2 Total Suspended Solids

A total of 519 samples (482 environmental samples plus 37 duplicates) were analyzed for TSS. Results ranged from non-detect to 388 mg/L. Summary statistics are presented in Table 4-4, and the data are included in Appendix C.

4.2.3 Water Quality Parameters

Summary statistics for general water quality parameters, including DO, turbidity, pH, specific conductance, and water temperature, measured during far-field and off-season monitoring are presented in Table 4-5. Far-field water quality data are included in Appendix D.

4.3 Off-season Monitoring Results

Off-season water column sampling was conducted from January 1 through April 25, 2013 in accordance with the Phase 2 RAM QAPP. The program was reinitiated upon completion of the far-field monitoring program on November 16, 2013. Samples were analyzed for Aroclor PCBs, PCBs by the mGBM and TSS.

4.3.1 Polychlorinated Biphenyls

A total of 82 routine samples (71 environmental samples plus 11 duplicates) for PCB analysis were collected during the 2013 off season. Two environmental samples, collected at Bakers Falls and Rogers Island, were analyzed for PCBs by the mGBM; and a total of 80 samples (69 environmental samples plus 11 duplicates) were analyzed for Aroclor PCBs. PCB results ranged from non-detect to 69.6 ng/L. Summary statistics by station are presented in Table 4-4, and the data are included in the database provided in Appendix C.

4.3.2 Total Suspended Solids

A total of 84 samples (73 environmental samples plus 11 duplicates) were analyzed for TSS. Results ranged from non-detect to 75.5 mg/L. Summary statistics are presented in Table 4-4, and the data are included in Appendix C.

4.4 High Flow Monitoring Results

High flow sampling was conducted twice during 2013, on April 21 and April 22. Samples were collected at the Lock 5 and Waterford automated sampling stations. A total of five samples (four environmental plus one duplicate) were analyzed for Aroclor PCBs and TSS. Summary statistics are presented in Table 4-4, and the data are included in Appendix C.

4.5 Results of Downstream Sediment Special Study

The downstream sediment special study targeted 184 locations in River Section 3 for sediment PCB sampling in 2013. However, 30 locations were abandoned due to poor recovery, and 19 locations were inaccessible due to low water and thick submerged aquatic vegetation cover. Figures 4-1a through 4-1p presents the locations and compositing scheme for the samples that were collected. A total of 74 individual and composite samples were submitted for Aroclor PCB, TOC, and grain size analyses. PCBs with three or more chlorine atoms (Tri+ PCBs) were calculated using the regression equation in the Phase 2 RAM QAPP, Appendix 4.3-1.

4.5.1 Polychlorinated Biphenyls

Total PCB results ranged from 0.171 milligrams per kilogram (mg/kg) to 7.18 mg/kg and Tri+ PCB results ranged from 0.66 to 3.65 mg/kg. Total PCB and Tri+ PCB results and summary statistics are provided in Table 4-6. The spatial distribution of Total PCB and Tri+ PCB results are shown in Figures 4-1a through 4-1p, and Figures 4-2a through 4-2p, respectively.

4.5.2 Total Organic Carbon

Results for TOC ranged from 130 to 51,000 mg/kg and summary statistics are provided in Table 4-6.

4.5.3 Grain Size

Average grain size composition was 10% clay, 38% silt, 48% sand, and 4% gravel. Summary statistics are provided in Table 4-6.

4.6 Fish Program Results

4.6.1 Polychlorinated Biphenyls

A total of 634 fish samples collected from the Hudson River during the 2013 field sampling season (472 samples in the spring and 162 samples in the fall) were submitted for Aroclor PCB analysis. Approximately 5% of these samples (32 samples) were also analyzed for PCBs by the mGBM. Of the samples analyzed for congener-specific PCBs, 22 were collected during the spring sampling, and 10 were collected during the late summer sampling. A comparison of PCB concentrations measured using Aroclor and congener-specific methods is presented in Figure 4-3. The fish sampling program dataset is provided in the RAMP fish database (Appendix E), and the results are summarized below.

4.6.1.1 Black Bass

Aroclor PCBs were detected in 126 of 145 black bass samples (including largemouth bass and smallmouth bass), as shown in Table 4-7 and Figure 4-4. Five black bass samples were also submitted for congener-specific PCB analysis. Congener-specific PCBs were detected in all five samples (Table 4-8).

4.6.1.2 Ictalurids

Aroclor PCBs were detected in 135 of 145 ictalurid samples (including brown bullhead, yellow bullhead, and channel catfish), as shown in Table 4-9 and Figure 4-5. Seven ictalurid samples were also submitted for congener-specific analysis. Congener-specific PCBs were detected in all seven ictalurids (Table 4-10).

4.6.1.3 Perch

Aroclor PCBs were detected in 110 of 125 perch samples (including yellow perch and white perch), as shown in Table 4-11 and Figure 4-6. Seven yellow perch samples were also submitted for congener-specific PCB analysis. Congener-specific PCBs were detected in all seven samples (Table 4-12).

4.6.1.4 Striped Bass

Aroclor PCBs were detected in 55 of 57 samples of striped bass, as shown in Table 4-13 and Figure 4-7. Three striped bass samples were also submitted for congener-specific PCB analysis. Congener-specific PCBs were detected in all three samples (Table 4-14).

4.6.1.5 Pumpkinseed

Aroclor PCBs were detected in 98 of 116 pumpkinseed samples, as shown in Table 4-15 and Figure 4-8. Five pumpkinseed samples were also submitted for congener-specific PCB analysis. Congener-specific PCBs were detected in all five samples (Table 4-16).

4.6.1.6 Forage Fish

Aroclor PCBs were detected in 40 of 46 forage fish (spottail shiner, golden shiner, fallfish, spotfin shiner, and mimic shiner) sample composites, as shown in Table 4-17 and Figure 4-9. Five forage fish composites were also submitted for congener-specific PCB analysis. Congener-specific PCBs were detected in all five samples (Table 4-18).

4.6.2 Lipids

Percent lipid was measured in all 634 fish samples using Method NE158_05. Summary statistics of the results, by Hudson River pool, are provided in Tables 4-19 (black bass fillets),

4-20 (ictalurid fillets), 4-21 (perch fillets), 4-22 (striped bass fillets), 4-23 (pumpkinseed whole-body samples), and 4-24 (forage fish composites). The lipid results are included in the fish dataset presented in the RAMP fish database (Appendix E).

4.6.3 Sex

Fish sex was determined for 368 fish samples collected in spring 2013. Results for fish sex are presented in this section by species. Summary statistics are included in tables for each species by Hudson River pool. The fish sex results are included in the fish dataset presented in the 2013 RAMP fish database (Appendix E).

4.6.3.1 Black Bass

Fish sex was determined in all 145 black bass (largemouth bass and smallmouth bass) to be 74 males and 71 females (Table 4-25).

4.6.3.2 Ictalurids

Fish sex was determined in 141 ictalurids (brown bullhead, yellow bullhead, and channel catfish) to be 70 males and 71 females (Table 4-26).

4.6.3.3 Perch

Fish sex was determined in 25 perch (yellow perch and white perch) to be 16 males and 9 females (Table 4-27).

4.6.3.4 Striped Bass

Fish sex was determined in all 57 striped bass samples collected from the Lower Hudson River stations (Albany/Troy, Catskill, and Tappan Zee), with the results showing 18 males and 39 females (Table 4-28).[6]

[6] Attempts were made to collect an even number of males and female striped bass from Albany/Troy by gently squeezing the fish along the flanks to see if eggs or milt were extruded by the females or males, respectively. This effort was unsuccessful. As confirmed in the laboratory, 9 females and 11 males were sampled at Albany/Troy.

4.6.4 Fish Field Observations

Fish condition was assessed using field measurements and observations. Observed external abnormalities were recorded to assess fish condition. Abnormalities that were observed with the most frequency are highlighted below. Information for all fish abnormalities can be found in the RAMP fish database (Appendix E).

Abnormalities were observed in fish collected from the reference area (Feeder Dam Pool). Eleven smallmouth bass had blackspot and two had a leech attached to a fin. One largemouth bass had white spot or a white parasite at the base of the caudal fin. Five yellow perch had blackspot and nine had white spot or a white parasite at the base of the caudal or pectoral fin. Three ictalurids had missing barbels, three had abrasions on the body, two had melanoma, and one had a leech attached to the body. Two pumpkinseeds had eroded caudal fins.

In the Thompson Island Pool, abnormalities observed in smallmouth bass included 15 with blackspot and 1 with a wound on the left pectoral fin and a split caudal fin. Of the largemouth bass, two had blackspot, four had whitespot, and two had lesions on the caudal fin. Of the yellow perch, 14 had blackspot, four had whitespot, two had leeches, and five had fin erosion. In the ictalurid group, five had melanoma, two had leeches attached, seven had lesions throughout the mouth and body, and four had fin erosion. One pumpkinseed had caudal fin erosion and one had blackspot and a small red discoloration on the spiny dorsal fin.

In the Northumberland/Fort Miller Pool, blackspot was observed in 13 of the smallmouth bass, along with two individuals with lesions, two with wounds, and one with whitespot and a leech attached. Of the largemouth bass, one had blackspot, two had a split caudal fin, and one had a hook wound. Of the yellow perch, six exhibited fin erosion, seven had blackspot, and four had split or missing fin rays. Ictalurids had eight with lesions in the mouth and on the body, three had melanoma, two had wounds, and six had missing barbels. Five pumpkinseeds had blackspot and one had a wound.

In the Stillwater Pool, ten of the smallmouth bass were observed with blackspot. Of the largemouth bass, three had melanoma, three had blackspot, and three had fin erosion. For

the yellow perch, 25 were observed with blackspot while eight also had eroded or deformed fins. Ictalurids were observed to have seven with melanoma, seven with lesions in the mouth or on the lower jaw, three with abrasions, and one with a small tumor on the dorsal fin. Of the pumpkinseeds, seven had blackspot and one had whitespot.

In the Albany/Troy Pool, three smallmouth bass were observed with blackspot, four had wounds on the lower jaw, and two had fin erosion. Four of the yellow perch had blackspot. Ictalurids had five with leeches attached, seven with missing barbels or whiskers, and three with missing or damaged eyes. One striped bass had lesions, one had black mottling on the snout, and two had fin damage. Two pumpkinseeds had blackspot.

At the Catskill location, two smallmouth bass had blackspot. Of the largemouth bass, two had fin erosion and one had whitespot on all of its fins. Ictalurids had five with red spots on the ventral side, two with wounds, and two with broken or regenerated spines. Of the striped bass, three had fin erosion.

At the Tappan Zee location, one striped bass had a hook wound, one had an eroded dorsal fin, and one had an abnormally shortened snout.

The weight and total length of captured fish were measured to assess fish condition. Condition index was determined using the following equation:

$$Condition\ Index(K) = \frac{Weight(g) * 100{,}000}{Length(mm)^3}$$

A condition index of 1.0 indicates a fish of normal condition. A condition index greater than 1.0 indicates a fish of better than average condition.

Black bass, ictalurids, perch, striped bass, and pumpkinseed captured from all five pools during the 2013 fish sampling program had an average condition index greater than 1.0 (Figures 4-10 through 4-14, respectively), except for the black bass at Northumberland/Fort Miller Pool, which had a condition index of 0.85. Forage fish captured during the 2013 fish sampling program had an average condition index less than 1.0 at Albany/Troy, Feeder Dam

and Thompson Island Pool, ranging from 0.91 to 0.93 (Figure 4-15). Forage fish captured at Northumberland/Fort Miller and Stillwater Pool had a condition index of 1.0 or greater.

4.7 Laboratory Analytical Data Packages

Electronic copies of the laboratory hardcopy data packages for water, fish, special study sediment, are included in Appendix F.

5 DATA QUALITY

5.1 Performance Evaluation Program

Aqueous PE samples were submitted to Pace for the 1-L and 8-L mGBM analyses as required by Section 11.2.1.1 of the Phase 2 RAM QAPP. In addition, sediment PE samples were submitted to Pace for Aroclor PCB analysis by GEHR8082 as required by Section 11.2.1.2 of the Phase 2 RAM QAPP. The results of the PE sample analyses were described in Section 3.1.

5.2 Validation/Verification

Electronic data verification and data validation of the analytical results were conducted as described in Section 3.8 to provide an understanding of the analytical data quality. The number of 2013 samples manually validated for each method and program is described in Section 3.8. Additionally, Appendix G provides a listing of each 2013 sample that was validated for each program, method, and laboratory. Appendix H provides copies of the eight data validation reports prepared for each group of 2013 sample data that were validated. These appendices provide the specific details of the data qualification resulting from the validation process.

Validation qualifier codes were placed next to the results in the GE analytical databases so that data users can quickly assess the qualitative and/or quantitative reliability of any result. The analytical database was then used to generate tabulated reports (data tables) of the validation results and qualifier codes. The final validated results for each dataset are presented as data tables in each data validation report included in Appendix H.

The same qualifier codes were used for both the data verification and validation processes. The qualifier codes and definitions used for the data were as follows:

- "Null": No qualifier code. The compound was detected and should be considered quantitatively and qualitatively valid based on the QC review.
- U: The compound/analyte was analyzed for, but was non-detect above the reported sample detection limit.

- <J: The sum of the positive PCB congener peaks for the sample is greater than zero but is below the sample-specific Total PCB method detection limit (MDL). Quantitation is approximate (estimated).
- U* (fish) or UB (water or sediment): The compound/analyte should be considered "non-detect" because it was detected in a blank at a similar level.
- J: Quantitation is approximate (estimated) due to limitations identified during the QA review (or data validation).
- N: The analysis indicates that there is presumptive evidence to make a "tentative identification" of this compound/analyte.
- R: Unusable (rejected) result. The compound/analyte may or may not be present in this sample.
- UR: Unusable "non-detect" result. The compound may or may not be present in this sample.
- UJ: This compound/analyte was non-detect, but the quantitation/detection limit is probably higher than reported due to a low bias identified during the QC review.
- S: The result should be considered suspect (e.g., where disparate data indicate sampling or analytical error).

The validation qualifier code field of the GE analytical database was queried to provide a tabulation of the number of results for each analysis fraction that were valid as reported (unqualified results and non-detected results U and, for Total PCBs only, <J), and those that were qualified with each qualifier code identified above. In several cases, inconsistencies were observed in the data and results were flagged as "suspect" ("S" qualifier). Results that were flagged as "suspect" were excluded from the completeness and usability calculations and therefore, from the tables included in this section. The results flagged as "suspect" in 2013 include the following:

- The PCB results from the Lock 5 24-hour composite sample collected from 06:00 on January 16, 2013 to 06:00 on January 17, 2013, sample OWS-LOC5-T130117095012, should be considered suspect (flagged "S" in the database) and were not used for evaluation purposes. Typically, the Aroclor and Total PCB concentrations for off-

season samples are either below or slightly above the MDL of approximately 16 ng/L. However, for the sample OWS-LOC5-T130117095012, an unusually high positive result for an off-season sample was observed (60.6 ng/L for Aroclor 1221 and total PCBs). It appears that a sample contamination error occurred in the field or at the laboratory as the Aroclor 1221 peak pattern does not resemble the Aroclor 1221 peak pattern typically observed in Hudson River water samples. In addition, non-detect results were observed for the same sample collection time period for Aroclors and Total PCBs in a field duplicate of the Lock 5 sample (sample OWS-BDUP-T130117095102), as well as samples collected at the Thompson Island Dam and Waterford stations.

- The PCB results from the Lock 5 24-hour composite sample collected from 06:00 on March 12, 2013 to 06:00 on March 13, 2013, sample OWS-LOC5-T130314090248, should be considered suspect (flagged "S" in the database) and not used for evaluation purposes. As noted above, the Aroclor and Total PCB concentrations for these off-season samples are typically either below or slightly above the MDL of approximately 16 ng/L. However, for sample OWS-LOC5-T130314090248, an unusually high positive result for an off-season sample was observed (260.1 ng/L for Total PCBs). Again, it appears that a sample contamination error occurred in the field or at the laboratory as the majority of the Total PCB concentration was made up of the higher chlorinated Aroclors (Aroclors 1248, 1254, and 1260 at 57.6 ng/L, 150 ng/L, and 30.5 ng/L, respectively) in addition to a small amount of altered Aroclor 1221 (22 ng/L), which is an unusual PCB pattern for a Hudson River sample. Non-detect results were observed for the same sample collection time period for Aroclors and Total PCBs for the samples collected at the Thompson Island Dam and Waterford stations. Furthermore, the presence of Aroclors 1248, 1254, and 1260 were not evident in the raw data for the matrix spike analysis of sample OWS-LOC5-T130314090248.
- The PCB result from the Bakers Falls sample collected on October 15, 2013 has been assigned an "S" qualifier in the database. This sample had a PCB concentration of approximately 9.9 ng/L, which is significantly higher than PCB concentrations that are normally measured at this station (typically less than approximately 2 ng/L). A review of sample collection, handling, and laboratory analytical procedures did not identify any significant discrepancies; however, PCBs were also detected in an

equipment blank associated with this sample at approximately 2.1 ng/L. Additionally, the composition of the PCBs in the sample resembled Aroclor 1242, which is not consistent with the PCB composition typically observed at Bakers Falls.

The percent usable and unusable data and the percent completeness were calculated for each analysis fraction according to the following equations:

% Usable Data	=	Unqualified Positive Results + #U (+#<J for Total PCBs) + #U*/UB + #J +#JN + #UJ/Total Number of Results
% Unusable Data	=	#R + #UR/Total Number of Results
% Completeness	=	Valid Data as Reported [Unqualified Positive Results + #U]/[Total Number of Results – positive results <RL - <J]

The percent completeness calculation does not include results qualified as estimated values ("J") due to being below the sample-specific reporting limit (RL) but above the MDL, or Total PCB results qualified as <J for being above zero but below the sample-specific MDL. These results are not included in the completeness calculation because they are estimated values pursuant to standard EPA analytical data reporting conventions.

A summary of the data quality for the individual analytical fractions is presented in the following sections. The data quality has been described based on the percent completeness and percent usable results as follows:

Qualitative Data Quality	Percent Completeness	Percent Usable
Excellent	95%	100%
Very Good	85%	95%
Good	75%	90%
Above Average	65%	85%
Average	45%	80%
Poor	<45%	<80%

The percent completeness goal stated in the Phase 2 RAM QAPP is 95%. The above Qualitative Data Quality (QDQ) index was based on professional judgment and experience.

It was developed to provide a qualitative framework to discuss the data quality. Although the description of data quality has been based on criteria for both the percent completeness and percent usable data calculations, the percent usable data calculation is a more critical reflection of the data quality than the percent completeness calculation. Percent completeness reflects the percentage of the data that satisfied all of the DQOs (i.e., the percentage of unqualified data), whereas percent usability reflects the percentage of the data that has some qualitative and/or quantitative use, which is inclusive of the data that satisfied all of the DQOs. The results of the percent completeness calculation do not indicate the nature of the qualification of the "incomplete" data. The data that are usable but qualitatively or quantitatively qualified may have no impact on the end use of the data, depending on what decisions need to be made based on those data. In other words, data that have low percent completeness may still be "100% usable" for decision-making purposes.

The following example calculations are provided based on the percent completeness, percent unusable, and percent usable data presented in Table 5-1 for RAMP Aroclor PCBs in water NE273_02) and following the explanations in Notes 6, 7, and 8:

1. Percent Completeness is the sum of results that were valid as reported [Unqualified Positive Results + U]/[Total Number of Results - J[4] - <J[3]].
   Ex. 95.2% = [(1,682 + 6,785)/(9,624 –730- 0)]*100
2. Percent Unusable Data is the sum of the results qualified R + UR/Total Number of Results.
   Ex. 0.0% = [(0 + 0)/9,624]*100
3. Percent Usable Data is the sum of the Unqualified Positive Results + U [+<J[3] for Total PCBs] + UB + J + JN + UJ/Total Number of Results.
   Ex. 100% = [(1,682 + 6,785 + 0 + 0 + 1,113 + 0 + 44)/9,624]*100

5.2.1 Data Verification and Validation Results for Water Samples

The overall data quality for the water sample data is very good and all results are usable (Table 5-1). The percent usable data, percent unusable data, and percent completeness for the entire water dataset are 100%, 0.0%, and 90.8%, respectively.

A comparison of the validation results to the results of the electronic verification was performed during the manual validation in order to provide an indication of the accuracy of the EDV process. The following issues were identified during this comparison for the EDV process used for the 2013 Phase 2 RAMP water dataset.

- The EDV process did not include an evaluation of equipment blank results associated with the samples collected for the near-field and far-field water monitoring programs. As specified in the Phase 2 RAM QAPP (Section 10.2.1.2), collection of equipment blanks was limited to samples collected for mGBM and Aroclor PCBs using non-automated sampling equipment (far-field water samples collected at the manual sampling locations) and filter blanks for samples collected for dissolved metals. With the exception of filter blanks for dissolved metals, equipment blanks were not required for water samples collected using dedicated, automated sampling equipment at near-field and far-field stations (used at Lock 5, Stillwater, and Waterford) because representative equipment blanks cannot be collected using these types of sampling equipment. Evaluation of the equipment blank results could result in additional qualification of select data as "UB" in manually collected samples (i.e., considered "non-detect" because the analyte was detected in a blank at a similar level).
- The EDV process did not include an evaluation of the "Calibration Compliant" field as planned by the Phase 2 RAM QAPP (Section 12.2.1). A separate query was performed on the database to identify any instances when the calibration associated with a result was reported to be non-compliant. The query did not identify any instances of non-compliant calibrations for the data included in this DSR.
- The EDV process evaluated holding times based on both dates and hour of the day instead of just dates for holding times expressed in units of days. For example, a sample analyzed for TSS on the seventh day after collection should be considered to be within the holding time of 7 days of collection regardless of the time of day that the sample was collected and analyzed. However, the EDV process qualified results as estimated if the sample was analyzed for TSS on the seventh day but at an hour of the day that was later than the hour of day that the sample was collected.

5.2.1.1 Data Verification and Validation Results for Polychlorinated Biphenyls by mGBM

The data quality for the water samples for PCBs analyzed by the mGBM (using SOPs NE294_00 and NE293_00) is very good (Table 5-1). The percent usable data, percent unusable data, and percent completeness for the entire mGBM PCB dataset are 100%, 0%, and 88.4%, respectively. None of the mGBM PCB results was qualified as unusable.
The EDV used to verify the PCB analytical data tracks the reason(s) that sample results are qualified for the individual assessment measures (e.g., holding times). The GE database was queried to determine why those data were qualified. However, results from manual validation are not tracked in the GE analytical database; thus, the validation reports were also evaluated manually. This combined assessment indicated that the EDV process identified the primary QC measures that resulted in qualification of data, as listed below:

- **Blank contamination**. Positive sample results that exhibited PCB concentrations similar to that in the equipment and method blanks were qualified as "non-detect" and flagged "UB." Qualification due to blank contamination occurred for approximately 7.8% of the mGBM PCB dataset. Equipment blank contamination was only evaluated during manual data validation. Qualification as "UB" solely due to equipment blank contamination occurred for 4.1% of the manually validated PCB sample results.
- **Field duplicate precision**. Water sample results associated with original and field duplicate samples that did not meet the project field duplicate precision criteria resulted in qualification of positive and "non-detect" results as estimated "J" and "UJ," respectively, for approximately 1.7% of the mGBM PCB dataset. A more detailed discussion on field duplicate results is presented in Section 5.3.
- **Total PCB results summed from estimated individual congener results**. The Total PCB results in all samples were qualified as estimated because at least one of the individual congener results that were summed to calculate the Total PCB result was qualified as estimated.

As the above list indicates, qualification of the mGBM PCB data for QC reasons occurred most often due to field duplicate imprecision and blank contamination. In addition to the reasons listed above, approximately 13% of the data were qualified as estimated "J" due to the

standard EPA analytical data reporting convention of qualifying data as estimated when they fall between the RL and the MDL.

5.2.1.2 Data Verification and Validation Results for Aroclor Polychlorinated Biphenyls

The data quality for the water samples for Aroclor PCBs analyzed by SOP NE273_02 is excellent (Table 5-1). The percent usable data, percent unusable data, and percent completeness for the entire Aroclor PCB dataset are 100%, 0.0%, and 95.2%, respectively. None of the Aroclor PCB results was qualified as unusable.

As noted above, the EDV used to verify the PCB analytical data tracks the reason(s) that sample results are qualified for the individual assessment measures. The GE database was queried to determine why those data were qualified. However, because results from manual validation are not tracked in the GE analytical database, the validation reports were also evaluated manually. This combined assessment indicated that the EDV process identified the primary QC measures that resulted in qualification of data, as follows:

- **Total PCB results summed from estimated individual Aroclor results**. The Total PCB results in 46% of the samples (5.8% of the results) were qualified as estimated because at least one of the individual Aroclor results that were summed to calculate the Total PCB result was qualified as estimated.
- **Surrogate recoveries outside of acceptance criteria**. Water sample results associated with surrogate recoveries outside of acceptance criteria (70% to 130%) resulted in qualification of positive and "non-detect" results as estimated "J" and "UJ," respectively, for approximately 0.67% of the Aroclor PCB data. Samples analyzed at a dilution factor of greater than five are not evaluated for surrogate recovery because the surrogate compounds are diluted out of the sample. The percentage of 2013 samples analyzed for Aroclor PCBs with a dilution factor greater than five was 0.25%.
- **Field duplicate precision**. Water sample results associated with original and field duplicate samples that did not meet the project field duplicate precision criteria resulted in qualification of positive and "non-detect" results as estimated "J" and "UJ,"

respectively, for approximately 0.094% of the Aroclor PCB dataset. A more detailed discussion on field duplicate results is presented in Section 5.3.

As the above list indicates, qualification of data for QC reasons occurred primarily due to out-of-criteria surrogate recoveries and field duplicate imprecision. In addition to these reasons, approximately 7.6% of the data were qualified as estimated "J" due to the standard EPA analytical data reporting convention of qualifying data as estimated when they fall between the RL and the MDL.

The Aroclor PCB results for several samples were deemed questionable based on PCB results for the same location in similar time periods or for the same time period at nearby locations. Laboratory errors were suspected and, after an investigation was performed, results were replaced in the database with results from reextraction and/or reanalysis of the samples, as follows:

- High Aroclor 1242: Aroclor 1221 ratios were observed in far-field water monitoring samples FRS-STWA-RM169.25-T130531135657 and FRS-WAFA-T130610071128 when compared to Aroclor 1242: Aroclor 1221 ratios for the same locations during similar time periods and river flows. Examination of the raw data for the sample analyses revealed a chromatographic interference consisting of repetitive peaks throughout the chromatogram that appeared to co-elute with several of the Aroclor 1242 quantitation peaks and possibly result in a positive bias in the Aroclor 1242 results. Upon laboratory inquiry, laboratory personnel attributed the chromatographic interference due to degradation of the septum in the injection port and residue build up in the injection syringe. Laboratory personnel had noted the chromatographic interference but had determined that it did not significantly impact the Total PCB results in water samples FRS-STWA-RM169.25-T130531135657 and FRS-WAFA-T130610071128; however, laboratory personnel did not recognize that elevated Aroclor 1242 concentrations attributed to the chromatographic interference could result in unusually high Tri+ PCB concentrations. Reanalysis of the sample extracts revealed that several of the interfering peaks co-eluted or eluted very closely to two of the five peaks used for quantitation of Aroclor 1242. No interference was observed with the peaks used for quantitation of Aroclor 1221 or the other three quantitation peaks used for quantitation of Aroclor 1242 (PCB-7, PCB-9, and PCB-

10). Very little difference was observed between the results for Aroclor 1221 in the original analyses (with interference) and the reanalyses (without interference); however, the Aroclor 1242 results in the reanalyses were significantly lower than in the original analyses due to the positive bias from the co-eluting interferent peaks in the original analyses. The reanalysis results replaced the original results in the database. In addition, the laboratory implemented several corrective actions to address the issue. These corrective actions included replacing the septa used in the injection ports with septa from a new source and returning to purchasing injection syringes from the manufacturer used previously. Furthermore, the laboratory proceeded to rerun samples if the chromatographic interference was identified in the future, and perform preventative maintenance pro-actively.

- A discrepancy was observed between the reported result for Aroclor 1254 in the laboratory EDD and the full laboratory analytical data package for far-field water monitoring sample FRS-WAFA-T130612071310. Upon inquiry, it was discovered that the Aroclor 1254 result had been updated at the laboratory between the time of submittal of the laboratory EDD (not detected at or above the MDL of 16.5 ng/L) and full laboratory analytical data package (positive result of 17.9 ng/L). The result in the full laboratory data package was the intended final Aroclor 1254 result for this sample and the updated result replaced the original result in the database.
- Three 24-hour composite near-field water samples collected from August 1 to August 2, 2013, were submitted to Pace on August 2, 2013, for Aroclor PCB analysis by SOP NE273_02. Pace reported a Total PCB concentration of 307 ng/L for the near-field water sample at RM 190.1 (sample NRS-190.10-T130802072916), which is the monitoring buoy deployed upstream of dredging activity for background information. Non-detect Total PCB results were reported for the background buoy samples collected throughout the previous week. Pace reported the Total PCB result as "non-detect" (ND) in the near-field sample collected at RM 181.0 (sample NRS-181.00-T130802073108), which is the near-field monitoring location furthest downstream of dredging. Positive Total PCB results were reported for the RM 181.0 samples collected throughout the previous week. A sample labeling or sample switch error was suspected due to the discrepancies amongst the reported results. Extra sample volume was available for both samples, so a reextraction and reanalysis was performed

and confirmed that a sample switch had occurred between two locations; a Total PCB concentration of 294 ng/L was reported for RM 181.0 and the total PCB result was "not detected" (ND) for RM 190.1. A labeling error during an extraction transfer step is the suspected cause of this issue. As a sample switch was apparent by the results of the reextraction, these reextraction results replaced the original results in the database. A single Pace analyst was involved in the extraction of the impacted samples. Pace personnel discussed and reviewed proper sample and extract transfer, handling, and labeling procedures with the analyst to minimize reoccurrence of this issue.

- Two 24-hour composite far-field water samples and one 24-hour composite near-field water field duplicate pair collected from August 13 to August 14, 2013, were submitted to Pace on August 14, 2013 for Aroclor PCB analysis by SOP NE273_02. Pace reported a Total PCB concentration of 397.9 ng/L for the far-field water sample at the Waterford automated station (sample FRS-WAFA-T130814091100) based on the Aroclor analysis, which was inconsistent with the subsequent Total PCB concentration of 138 ng/L based on mGBM analysis of the same extract in SDG COC13090476. In addition, the Aroclor results for sample FRS-WAFA-T130814091100 were higher than expected based on recent results at Waterford and other far-field stations. A review of the analytical run log associated with the initial Aroclor analysis of sample FRS-WAFA-T130814091100 revealed that another sample in the same batch had already been reanalyzed due to an unrelated reason. The results of the initial unreported analysis (229.8 ng/L) and reported reanalysis (463.6 ng/L) of near-field sample NRS-182.30-T130814090941 for Aroclor PCBs were also inconsistent with one another. Furthermore, the analytical run log revealed that samples FRS-WAFA-T130814091100, NRS-182.30-T130814090941, and NRS-BDUP-T130814090958 were analyzed in a different order than appeared on the associated extraction log, which was indicative of a re-ordering of the samples that might have led to the switching of samples at the instrument. As a result, it was decided that all extracts from the initial analytical run should be reanalyzed. As a sample switch was apparent by the results of the reanalyses, the reanalysis results replaced the original results in the database for samples FRS-WAFA-T130814091100, NRS-182.30-T130814090941, and NRS-BDUP-T130814090958.

5.2.1.3 Data Verification and Validation Results for Other Parameters

The data quality for total metals and dissolved metals by EPA Method 200.8 is very good (Table 5-1). The percent usable data, percent unusable data, and percent completeness for the total metals by EPA Method 200.8 dataset are 100%, 0%, and 85.7%, respectively. The percent usable data, percent unusable data, and percent completeness for the dissolved metals by EPA Method 200.8 dataset are 100%, 0%, and 87.5%, respectively. None of the metals or hardness results was qualified as unusable. The queries of the GE database and manual evaluation of the data validation reports revealed that metals sample results were qualified for the following reasons:

- **Field duplicate precision**. Water sample results associated with original and field duplicate samples that did not meet the project field duplicate precision criteria resulted in qualification of positive and "non-detect" results as estimated "J" and "UJ," respectively, for approximately 8.3% of the total metals dataset (twp results). A more detailed discussion on field duplicate results is presented in Section 5.3.
- **Blank contamination**. Qualification of trace-level positive results as "UB," due to equipment/filter, method, or calibration blank contamination occurred for 5.6% of the total and dissolved metals sample results (4.2% of the total metals results and 8.3% of the dissolved metals results). Equipment/filter and calibration blank contamination was only evaluated during manual data validation and did not result in any additional qualification.

As the above list indicates, qualification of data for QC reasons occurred primarily due to field duplicate imprecision. Qualification of total and dissolved metals data also occurred primarily due to blank contamination of trace-level results. In addition to the above-listed reasons, approximately 19% of the total and dissolved metals by EPA 200.8 data were qualified as estimated "J" pursuant to the standard EPA analytical data reporting convention of qualifying data as estimated that fall between the RL and the MDL.

The data quality analyzed for hardness by SM 2340B is good (Table 5-1). The percent usable data, percent unusable data, and percent completeness for the hardness dataset are 100%, 0%, and 83%, respectively. The queries of the GE database and manual evaluation of the data validation reports revealed that one hardness result was qualified for the following reason:

- **Field duplicate precision**. Water sample results associated with original and field duplicate samples that did not meet the project field duplicate precision criteria resulted in qualification of positive and "non-detect" results as estimated "J" and "UJ," respectively, for approximately 17% of the hardness dataset (1 result). A more detailed discussion on field duplicate results is presented in Section 5.3.

The data quality for TSS by SM 2540D is good (Table 5-1). The percent usable data, percent unusable data, and percent completeness for the TSS dataset are 100%, 0%, and 77.3%, respectively. None of the TSS results was qualified as unusable. The queries of the GE database and manual evaluation of the data validation reports revealed that TSS sample results were qualified for the following reasons:

- **Laboratory replicate precision**. Water sample results associated with original and laboratory replicate samples that did not meet the project's laboratory replicate precision criteria resulted in qualification of positive results as estimated "J" and "non-detected" results as estimated "UJ" for approximately 19% of the TSS sample results.
- **Field duplicate precision**. Qualification of positive results as estimated "J" and "non-detected" results as estimated "UJ" due to field duplicate imprecision occurred for approximately 2.4% of the TSS sample results. A more detailed discussion on field duplicate results is presented in Section 5.3.
- **Exceeded holding times**. Qualification of positive results as estimated "J" and "non-detected" results as estimated "UJ" due to the TSS analysis being performed beyond the 7-day holding time from collection to analysis occurred for approximately 1.7% of the TSS sample results; however, as noted previously, the EDV process evaluated holding times based on both dates and hour of the day instead of just dates for holding times expressed in units of days. The TSS analyses were actually performed within the required holding time.
- **LCS recoveries outside of acceptance criteria**. Water sample results associated with LCS recoveries outside of acceptance criteria (85% to 115%) resulted in qualification of positive and "non-detect" results as estimated "J" and "UJ," respectively, for approximately 0.79% of the TSS sample results.

- **LCS/LCS duplicate precision.** LCS/LCS duplicate (LCSD) prevision was only evaluated during manual validation. As stated in Section 3.2.1.6, some of the sample batches for TSS did not include the required laboratory replicate (but an overall rate of 5% was met). The laboratory included a LCSD in addition to an LCS in batches that did not contain a laboratory replicate. The precision between the LCS/LCSD results were evaluated based on laboratory replicate criteria during manual validation. Water sample results associated with LCS/LCSD results that did not meet the project's laboratory replicate precision criteria resulted in qualification of positive results as estimated "J" and "non-detected" results as estimated "UJ" for approximately 6.9% of the manually-validated TSS sample results (0.47% of the entire TSS data set).
- **Blank contamination**. Positive sample results that exhibited PCB concentrations similar to that in the method blanks were qualified as "non-detect" and flagged "UB." Qualification due to blank contamination occurred for approximately 0.079% of the TSS dataset.

As shown by the above list, qualification of TSS data occurred primarily due to laboratory replicate and field duplicate imprecision.

5.2.2 Data Verification and Validation Results for Fish Tissue Samples

The overall data quality for the fish tissue sample data is excellent, and all of the results are excellent (Table 5-2). The percent usable data, percent unusable data, and percent completeness for the entire fish tissue dataset are 100%, 0%, and 96.4%, respectively. None of the fish tissue results was qualified as unusable.

A comparison of the validation results to the results of the electronic verification was performed during the manual validation in order to provide an indication of the accuracy of the EDV process. One issue was identified during this comparison, which relates to the Total PCB results calculated from Aroclor PCBs: the EDV process did not qualify the reported positive results for Total PCBs summed from estimated Aroclor results as estimated ("J") when Aroclor results were qualified as estimated solely due to quantitation below the RLs. The impact of this issue is expected to be minimal because Total PCB results were qualified as estimated ("J") if the Total PCB result was less than its RL.

5.2.2.1 Data Verification and Validation Results for Polychlorinated Biphenyls as Aroclors

The data quality for Aroclor PCBs in fish tissue analyzed by Method NE148_08 (identified as NE148_04 in the database) is excellent (Table 5-2). The percent usable data, percent unusable data, and percent completeness for the entire Aroclor PCB dataset are 100%, 0%, and 99.3%, respectively. None of the results was qualified as unusable.

As discussed above for the water samples, the EDV used to verify the PCB analytical data tracks the reason(s) that sample results are qualified for the individual assessment measures. The GE database was queried to determine why those data were qualified. However, because results from manual validation are not tracked in the GE analytical database, the validation reports were also evaluated manually. This combined assessment indicated that the EDV process identified the primary QC measures that resulted in qualification of data, as listed below:

- **Laboratory replicate imprecision**. Fish tissue sample results associated with original and laboratory replicate samples that did not meet the project laboratory's replicate precision criteria resulted in qualification of a positive result as estimated "J" for approximately 0.18% of the sample results.
- **Surrogate recoveries outside of acceptance criteria**. Fish tissue sample results associated with surrogate recoveries outside of acceptance criteria (60% to 140%) resulted in qualification of positive and "non-detect" results as estimated "J" and "UJ," respectively, for approximately 0.08% of the Aroclor PCB data. Samples analyzed at a dilution factor of greater than five were not evaluated for surrogate recovery because the surrogate compounds are diluted out of the sample. The percentage of 2013 samples analyzed for Aroclor PCBs with a dilution factor greater than five was 3.0%.

As the above list indicates, qualification of Aroclor PCB data as estimated "J" or "UJ" for QC reasons occurred in only a small portion of the data. In addition to these reasons, approximately 3.5% of the data were qualified as estimated "J" due to the standard EPA analytical data reporting convention of qualifying data as estimated when they fall between the RL and the MDL.

5.2.2.2 Data Verification and Validation Results for PCB Congeners

The data quality for the fish tissue sample PCBs congeners analyzed by NE013_10 is very good (Table 5-2). The percent usable data, percent unusable data, and percent completeness for the entire PCB congener data set are 100%, 0%, and 90.7%, respectively. None of the results was qualified as unusable. The queries of the GE database revealed that the PCB congener sample results were qualified for the following reasons, listed in order of decreasing frequency:

- **Exceeded holding times**. Qualification of positive results as estimated "J" and "non-detected" results as estimated "UJ" due to the PCB congener analysis being performed beyond the 40-day holding time from extraction to analysis occurred for approximately 5.7% of the PCB congener sample results.
- **Blank contamination**. Positive sample results that exhibited PCB concentrations similar to that in the method blanks were qualified as "non-detect" and flagged "U*." Qualification due to blank contamination occurred for approximately 3.1% of the sample results and was limited to individual PCB congener results.
- **Total PCB results summed from estimated individual congener results.** The Total PCB results in all samples (35) were qualified as estimated because at least one of the individual congener results that were summed to calculate the Total PCB result was qualified as estimated.

As the above list indicates, qualification of data occurred primarily from exceeded holding times and blank contamination. Additionally, approximately 29% of the data were qualified as estimated "J" due to the standard EPA analytical data reporting convention of qualifying data as estimated when they fall between the RL and the MDL.

5.2.2.3 Data Verification and Validation Results for Lipid Content

The data quality for the fish tissue sample lipids content analyzed by NE158_05 (identified as NE158_03 in the database) is excellent (Table 5-2). The percent usable data, percent unusable data, and percent completeness for the entire lipid content dataset are 100%, 0%, and 98.7%, respectively. None of the results was qualified as unusable. The queries of the GE database revealed that a small percentage of the lipid content sample results were

qualified as estimated "J" due to laboratory replicate imprecision. Specifically, approximately 1.3% of the sample results were qualified as estimated "J" because the sample results associated with original and laboratory replicate samples did not meet the project laboratory's replicate precision criteria.

5.2.3 Data Verification and Validation Results for Special Study Sediment Samples

The overall data quality for the special study sediment sample data is good, and all of the results are usable (Table 5-3). The percent usable data, percent unusable data, and percent completeness for the entire special study sediment dataset are 100%, 0%, and 76.1 %, respectively. None of the sediment results was qualified as unusable. The lower percent completeness (relative to other matrices) was primarily driven by qualification of data as estimated due to low percent solids (19% of the special study sediment samples). The percent solids of samples are intrinsic to the sediment sampled and cannot be controlled by field or laboratory personnel.

A comparison of the validation results to the results of the electronic verification was performed during the manual validation in order to provide an indication of the accuracy of the EDV process. One issue was identified during this comparison: the EDV process did not include an evaluation of the "Calibration Compliant" field as planned by the Phase 2 RAM QAPP (Section 12.2.1). A separate query was performed on the database to identify any instances when the calibration associated with a result was reported to be non-compliant. The query did not identify any instances of non-compliant calibrations for the data included in this DSR.

5.2.3.1 Data Verification and Validation Results for Polychlorinated Biphenyls as Aroclors

The data quality for PCBs as Aroclors in special study sediment analyzed by SOP GEHR8082 is good (Table 5-3). The percent usable data, percent unusable data, and percent completeness for the entire PCBs as Aroclors dataset are 100%, 0%, and 78.0%, respectively. None of the results was qualified as unusable.

A query of the GE analytical database to determine the reasons that these PCB data were qualified, supplemented by a manual review of the data validation reports, indicated that the primary QC measures that resulted in qualification of data, as identified by the EDV process, were as follows:

- **Low percent solids**. Sediment samples that had less than 50% solids resulted in qualification of positive results and detection limits as estimated, "J" and "UJ," respectively, in accordance with EPA Region 2 validation criteria. Positive results and detection limits are reported on a dry-weight basis for the sediment samples to reflect the solids content of the samples; however, GE complied with the EPA Region 2 guidance to qualify sediment sample results with less than 50% solids. Approximately 19% of the sample results were qualified as "J" or "UJ" due to low percent solids.
- **Total PCB results summed from estimated individual Aroclor results**. The Total PCB results in 30% of the samples (5.1% of the results) were qualified as estimated because at least one of the individual Aroclor results that were summed to calculate the Total PCB result was qualified as estimated.
- **Field duplicate precision**. Sediment sample results associated with original and field duplicate samples that did not meet the project field duplicate precision criteria resulted in qualification of positive and "non-detect" results as estimated "J" and "UJ," respectively, for approximately 0.68% of the Aroclor PCB dataset. A more detailed discussion on field duplicate results is presented in Section 5.3.

As the above list indicates, qualification of data as estimated ("J" or "UJ") for QC reasons occurred most often due to low percent solids. The percent solids of the samples cannot be controlled.

5.2.3.2 Data Verification and Validation Results for Total Organic Carbon

The data quality for the TOC analyzed by the Lloyd Kahn method is average (Table 5-3). The percent usable data, percent unusable data, and percent completeness for the entire TOC dataset are 100%, 0%, and 51.4%, respectively. None of the results was qualified as unusable. The queries of the GE database revealed that the TOC sample results were qualified for the following reasons:

- **MS recoveries outside of acceptance criteria**. Sediment sample results associated with MS recoveries outside of acceptance criteria (75% to 125%) resulted in qualification of positive results as estimated "J" for approximately 34% of the TOC sample results.
- **Low percent solids**. Sediment samples that had less than 50% solids resulted in qualification of positive results and detection limits as estimated "J" and "UJ," respectively, in accordance with EPA Region 2 validation criteria. Positive results and RLs are reported on a dry-weight basis for the sediment samples to reflect the solids content of the samples; however, GE complied with the EPA Region 2 guidance to qualify sediment sample results with less than 50% solids. Approximately 19% of the sample results were qualified as "J" or "UJ" due to low percent solids.

As the above list indicates, the most frequent reason for qualification of some of these TOC data as estimated "J" was matrix spike recovery and low percent solids.

5.3 Field Duplicates

Water and sediment field duplicates were generally prepared in the field for the Phase 2 RAMP at the rate of 5% of the total number of environmental samples or one per sample batch of up to 20 samples (refer to Section 3.2 for the specific frequency for each method). Fish tissue field duplicates were not submitted for analysis because it is impossible to collect field duplicates for fish samples.

The precision criteria for field duplicate pairs are presented in Section 10.3.1 of the Phase 2 RAM QAPP. For water field duplicate pairs where both results were greater than or equal to five times the RL, the precision criterion is that the relative percent difference (RPD) between the results should be less than or equal to 35% for PCBs (Aroclor and mGBM), and less than or equal to 20% for all other parameters. For sediment field duplicate pairs where both results were greater than or equal to five times the RL, the precision criterion is that the RPD between the results should be less than or equal to 40% for all parameters. For water field duplicate pairs where at least one of the results was less than five times the RL (including when one result was a non-detect), the precision criterion is that the difference between the results should be less than or equal to the RL. For sediment field duplicate pairs where at least one of the results was less than five times the RL (including when one result

was a non-detect), the precision criterion is that the difference between the results should be less than or equal to two times the RL. A value of half the RL was used for non-detect results in the difference calculation. If the analyte was not detected in the sample or the field duplicate sample, the RPD was not calculated and a quantitative evaluation was not made because neither sample had a positive result.

5.3.1 Aqueous Field Duplicate Results for Polychlorinated Biphenyls

A summary of the field duplicate results for RAMP water samples analyzed for PCBs by the mGBM (using SOPs NE294_00 or NE294_00A and NE293_00) is presented in Table 5-4. A summary of the field duplicate results for water samples analyzed for Aroclor PCBs by NE273_02 is presented in Table 5-5. The tables each include the following information:

- The total number of field duplicate pairs is presented in the column with the heading "Total No. Field Duplicate Pairs." The table presents the total number of field duplicate pairs for each analyte as well as the total number of field duplicate result pairs.
- The total number of the field duplicate pairs that had non-detect results in both the parent sample and field duplicate is presented in the column with the heading "Total No. Field Duplicate Pairs with NDs for Both Samples" (all of these met field duplicate precision criteria because both results are "non-detect"). This information is also presented by analyte.
- The total number of the field duplicate pairs that had positive results in the field duplicate and/or parent sample is presented in the columns under the heading "Total No. Field Duplicate Pairs with Positives in Either Sample." The total number ("Total No."), the number that met criteria ("No. Meet Criteria"), and the number that did not meet criteria ("No. Do Not Meet Criteria"), as well as the percentages that met criteria ("% Meet Criteria") and did not meet criteria ("% Do Not Meet Criteria"), are presented. This information is also presented by analyte.
- The overall percentage of results that met criteria is presented in the column with the heading "Overall % Meet Criteria." This information is also presented by analyte.

A total of 41 whole water field duplicate pairs were analyzed for PCBs by the mGBM (using NE294_00 or NE294_00A and NE293_00). A high percentage (96%) of the results met the field duplicate precision criteria. For Total PCBs, 100% of the results met the field duplicate precision criteria. For the individual PCB congeners, the percentage of results that met the field duplicate precision criteria ranged from 59% to 100%. The percentage of field duplicate pairs with positive results in either sample that met the field duplicate precision criteria was 91% for all analytes and 100% for Total PCBs.

A total of 103 field duplicate pairs were analyzed for Aroclor PCBs by NE273_02. Of these results, 99% met the field duplicate precision criteria. For Total PCBs, 95% of the results met the field duplicate precision criteria. For the individual PCB Aroclors, the percentage of results that met the field duplicate precision criteria ranged from 99% to 100%. The percentage of field duplicate pairs with positive results in either sample that met the field duplicate precision criteria was 97% for all analytes and 95% for Total PCBs.

5.3.2 Aqueous Field Duplicate Results for Other Parameters

A summary of the RAMP field duplicate results for water samples analyzed for TSS by Methods SM 2540D, total metals by EPA 200.8, dissolved metals by EPA 200.8 and hardness by Standard Method 2340B is presented in Table 5-6. The table includes, for each parameter/method, the same information described in Section 5.3.1 for Table 5-5.

A total of 141 field duplicate pairs were analyzed for TSS and 79% of the results (78% of the positive results) met field duplicate precision criteria.

Good precision was generally demonstrated by the field duplicate pair results for metals and hardness (Table 5-6). One field duplicate pair was analyzed for total metals (Cd, Pb, magnesium, and calcium) and hardness. Total Cd and Pb met the field duplicate precision criteria, but hardness (and magnesium and calcium, which are used to calculate hardness) did not meet criteria. One field duplicate pairs was analyzed for dissolved metals (Cd and Pb) and 100% of the results met field duplicate precision criteria.

5.3.3 Sediment Field Duplicate Results for Aroclor Polychlorinated Biphenyls

A summary of the field duplicate results for the special study sediment samples analyzed for Aroclor PCBs by SOP GEHR8082 is presented in Table 5-7. The tables each include the same information described in Section 5.3.1 for Table 5-5.

A total of six sediment field duplicate pairs were analyzed for Aroclor PCB by SOP GEHR8082. A high percentage (92%) of the results met the field duplicate precision criteria. For Total PCBs, 100% of the results met the field duplicate precision criteria. For the individual Aroclors, the percentage of results that met the field duplicate precision criteria ranged from 67% to 100%. The percentage of field duplicate pairs with positive results in either sample that met the field duplicate precision criteria was 81% for all analytes and 100% for Total PCBs.

5.3.4 Sediment Field Duplicate Results for Other Parameters

A summary of the field duplicate results for special study sediment samples analyzed for TOC and moisture content is presented in Table 5-8. The table includes, for each parameter, the same information described in Section 5.3.1 for Table 5-5.

Very good precision was demonstrated by the field duplicate pair results for TOC (Table 5-8). A total of six field duplicate pairs were analyzed for TOC and 100% of the results met the field duplicate precision criteria. Better precision was demonstrated for moisture content. A total of six field duplicate pairs were analyzed for moisture content and 100% of the results met field duplicate precision criteria.

5.4 Equipment Blanks

Equipment blanks were collected for water and special study sediment samples at the frequencies described in Section 3.2.1.4 to monitor the potential for external contamination during sample collection. As previously indicated, equipment blanks were not collected for water samples obtained with automated samplers or fish tissue samples.

As discussed in Section 3.2.1.4, the collection of aqueous equipment blanks in the 2013 water sampling program was limited to samples collected for mGBM and Aroclor PCB analyses

using non-automated sampling equipment (far-field water samples collected at the manual sampling locations) and to filter equipment blanks for dissolved metals regardless of the initial sampling technique (i.e., manual or automated). Summary statistics for the results from the 2013 aqueous equipment blanks with analyte positive results greater than the MDL are presented in Table 5-9.

None of the six aqueous equipment blanks collected for Aroclor PCB analysis in association with the manual far-field sampling locations had positive results for Aroclors or Total PCBs. One of the eleven aqueous equipment blanks collected for PCB analysis by the mGBM (NE294_00 and NE293_00) in association with the manual far-field sampling locations had a Total PCB concentration above the MDL of 2.08 ng/L. Upon inquiry, it was discovered that this equipment blank had been collected incorrectly. Trace concentrations of the individual PCB congeners were detected in the whole water equipment blanks (Table 5-9). Three of the five of the filter blanks collected for dissolved metals had trace-level positive results for dissolved Pb (Table 5-9).

The impacts of the 2013 aqueous equipment blanks were not assessed during the EDV process (as noted in Section 5.2.1); however, the impacts of some of those aqueous equipment blank concentrations were assessed during the manual data validation processes and affected sample results were qualified as "UB." Evaluation of the remaining equipment blank results could result in additional qualification of some data in manually collected samples as "UB." Based on the manual validation, the sample results with the greatest potential for impact from additional blank evaluation would be dissolved metals results.

For the special study sediment samples, equipment blanks were collected for the samples submitted for analyses of Aroclor PCBs and TOC. None of the six sediment equipment blanks had positive results for Aroclor PCBs or TOC.

6 REFERENCES

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TABLES

Table 2-1

Near-field and Far-field Monitoring Roles

Function	Station ID	Approximate River Mile	Description	Monitoring Role	Start Date	End Date	Sampling Frequency
Background Monitoring	NFS-BCKGRD-RM190.10	190.10	Single Buoy	CUs 49 - 100	April 29, 2013	October 31, 2013	Daily
	NFS-BCKGRD-RM191.50	191.50		CUs 49 - 100	June 7, 2013	July 10, 2013	Daily
	MONITORING-TRAN-RM187.50	187.50	Thompson Island automated station	CUs 67 - 100	October 31, 2013	November 8, 2013	Daily
Near-field Monitoring	MONITORING-TRAN-RM187.50	187.50	Thompson Island automated station	CUs 49 - 60	April 29, 2013	October 31, 2013	Daily
	MONITORING-TRAN-RM185.40	185.40	4 buoy transect	CUs 67 - 70	April 29, 2013	July 10, 2013	Daily
	MONITORING-TRAN-RM184.80	184.80		CU71	July 10, 2013	July 23, 2013	Daily
	MONITORING-TRAN-RM183.80	183.80		CUs 72 - 73	July 23, 2013	August 5, 2013	Daily
	MONITORING-TRAN-RM182.30	182.30	Lock 5 automated station	CUs 74 - 77	August 5, 2013	August 16, 2013	Daily
	MONITORING-TRAN-RM182.00	182.00	2 buoy transect	CU78	May 14, 2013	May 28, 2013	Daily
	MONITORING-TRAN-RM181.00	181.00			May 28, 2013	October 3, 2014	Daily
	MONITORING-TRAN-RM180.70	180.70		CU79	October 3, 2013	October 31, 2013	Daily
	MONITORING-TRAN-RM176.10	176.10		CUs 82 - 84	October 4, 2013	November 8, 2013	Daily
	WFF-WAFA	157.00	Waterford automated station and buoy on east side of channel	CU99	October 31, 2013	November 11, 2013	Daily
	WFF-GNIA-RM153	153.00	2 buoy transect	CU100	October 30, 2013	November 15, 2013	Daily
Far-field Monitoring	WFF-BAFA	197.10	Bakers Falls manual station	Upstream	May 8, 2013	November 15, 2013	Monthly
	WFF-ROIS	194.60	Rogers Island manual station	RAMP Background/PCRDMP Downstream	May 8, 2013	November 15, 2013	Monthly
					June 21, 2013	July 15, 2013	Weekly
	WFF-LOC5	182.30	Lock 5 automated station	CUs 49 - 54	April 29, 2013	May 14, 2013	Daily
	WFF-STWA	168.30	Stillwater manual station	CUs 49 - 54	May 1, 2013	May 13, 2013	Weekly
				CUs 55 - 60 and 67 - 84[1]	June 14, 2013	June 17, 2013	Daily
		169.25	Stillwater RM169.25 automated station (4 buoy transect)	CUs 55 - 60 and 67 - 84	May 14, 2013	November 8, 2013	Daily
	WFF-WAFA	157.00	Waterford automated station	CUs 49 -99	April 28, 2013	October 31, 2013	Daily
			Waterford automated station and buoy on east side of channel		October 31, 2013	November 11, 2013	Daily
	WFF-GNIA-RM153	153.00	2 buoy transect	CUs 49 - 100	November 2, 2013	November 5, 2013	Daily
	WFF-LHAL	145.00	Albany manual station	Lower River	May 21, 2013	November 11, 2013	Monthly
				CU100	October 30, 2013	November 8, 2013	Daily
	WFF-LHPO	76.00	Poughkeepsie manual station	Lower River	May 21, 2013	October 29, 2013	Monthly
Informational	WFF-LOC5	182.30	Lock 5 automated station	Informational	May 14, 2013	August 4, 2013	Weekly
					August 17, 2013	November 10, 2013	
	WFF-GNIA-RM153	153.00	2 buoy transect		October 15, 2013	October 18, 2013	Daily
	WFF-LHAL	145.00	Albany manual station		October 15, 2013	October 18, 2013	Daily
					June 27, 2013	June 27, 2013	Single Grab
					August 20, 2013	August 20, 2013	

Notes:

1: Manual samples collected due to high river flows

BAFA = Bakers Falls
CU = Certification Unit
GNIA = Green Island
LHAL = Lower Hudson Albany
LHPO = Lower Hudson Poughkeepsie
LOC5 = Lock 5
PCRDMP = Post Construction Remnant Deposit Monitoring Program
RAMP = Remedial Action Monitoring Program
ROIS = Rogers Island
STWA = Stillwater
STWA-RM169.25 = Stillwater RM169.25 buoy transect
WAFA = Waterford

Table 2-2
Near-field Sample Collection, Handling, and Analysis Summary

Analyte	Container Specifications	Preservation	Analytical Method	Turnaround Time[1]		
				Routine Sampling	Metals Exceedance Sampling	Holding Time[2]
Aroclor PCBs	1-L amber glass	Cool, 4°C +/- 2°C	EPA 508	72 hours	NA	365 days to extraction, 40 days to analysis
Low-level mGBM PCBs	2-L to 4-L amber glass	Cool, 4°C +/- 2°C	Low MDL mGBM	Standard	NA	365 days to extraction, 40 days to analysis
TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	24 hours	NA	7 days
Total cadmium (Cd), lead (Pb)	500-mL HDPE plastic bottle (no liner)	HNO_3 to pH <2	EPA 200.8	72 hours	NA	180 days
Dissolved cadmium (Cd), lead (Pb)	500-mL HDPE plastic bottle (no liner)	Field filter, HNO_3 to pH <2	EPA 200.8	72 hours	NA	180 days
Hardness	(from total Cd, Pb container)	--	SM 2340B	72 hours	24 hours	180 days
Total TAL metals	500-mL HDPE plastic bottle (no liner)	HNO_3 to pH <2	EPA 200.8	NA	24 hours	180 days
Dissolved TAL metals	500-mL HDPE plastic bottle (no liner)	Field filter, HNO_3 to pH <2	EPA 200.8	NA	24 hours	180 days
Total mercury	1-L HDPE plastic bottle (no liner)	HNO_3 to pH <2	EPA 245.1	NA	24 hours	28 days
Dissolved mercury	1-L HDPE plastic bottle (no liner)	Field filter, HNO_3 to pH <2	EPA 245.1	NA	24 hours	28 days
Total chromium (hexavalent)	250-mL HDPE plastic bottle (no liner)	Cool, 4°C +/- 2°C	SW-846 7196A	NA	24 hours	24 hours
Dissolved chromium (hexavalent)	250-mL HDPE plastic bottle (no liner)	Field filter, cool, 4°C +/- 2°C	SW-846 7196A	NA	24 hours	24 hours

Notes:
1. All turnaround times run from time of verified time of sample receipt.
2. Holding times start on the date of collection.
3. Modified to be consistent with American Society for Testing and Materials (ASTM) Method D3977-97.

°C = degrees Celsius
EPA = U.S. Environmental Protection Agency
HDPE = high-density polyethylene
HNO_3 = nitric acid
L = liter
MDL = method detection limit
mGBM = Modified Green Bay Method
mL = milliliter
NA = not analyzed
PCB = polychlorinated biphenyl
TAL = target analyte list
TSS = total suspended solid

Table 2-3
Far-field Sample Collection, Handling, and Analysis Summary

Station	Analyte	Container Specifications	Preservation	Analytical Method	Turnaround Time[1]		Holding Time[2]
					Routine	Contingency	
Bakers Falls	Low-level mGBM PCBs	(2) 4-L amber glass bottles	Cool, 4°C +/- 2°C	Low MDL mGBM	Standard	NA	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	Standard	NA	7 days
Rogers Island	Low-level mGBM PCBs	(2) 4-L amber glass bottles	Cool, 4°C +/- 2°C	Low MDL mGBM	Standard	NA	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	Standard	NA	7 days
Lock 5	Aroclor PCBs	1-L amber glass bottle	Cool, 4°C +/- 2°C	Modified EPA 508	24 hours	NA	365 days to extraction, 40 days to analysis
	mGBM PCBs[4]	NA - performed on Aroclor PCB extract	Cool, 4°C +/- 2°C	mGBM	Standard	NA	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	24 hours	NA	7 days
Stillwater	Aroclor PCBs	1-L amber glass bottle	Cool, 4°C +/- 2°C	Modified EPA 508	24 hours	NA	365 days to extraction, 40 days to analysis
	mGBM PCBs[4]	NA - performed on Aroclor PCB extract	Cool, 4°C +/- 2°C	mGBM	Standard	NA	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	24 hours	NA	7 days

Table 2-3
Far-field Sample Collection, Handling, and Analysis Summary

Station	Analyte	Container Specifications	Preservation	Analytical Method	Turnaround Time[1]		Holding Time[2]
					Routine	Contingency	
Waterford	Aroclor PCBs	1-L amber glass bottle	Cool, 4°C +/- 2°C	Modified EPA 508	72 hours	NA	365 days to extraction, 40 days to analysis
	mGBM PCBs[4]	NA - performed on Aroclor PCB extract	Cool, 4°C +/- 2°C	mGBM	Standard	NA	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	24 hours	NA	7 days
Albany, Poughkeepsie	Aroclor PCBs	1-L amber glass bottle	Cool, 4°C +/- 2°C	Modified EPA 508	Standard	24 hours	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	Standard	24 hours	7 days

Notes:

1. All turnaround times (TATs) run from verified time of sample receipt at laboratory; standard TAT is 20 business days.
2. Holding times start on the date of collection.
3. Modified to be consistent with American Society for Testing and Materials (ASTM) Method 3977-
4. Aroclor PCB extract was selected monthly for mGBM PCB analysis.
5. Samples to be analyzed for mGBM PCBs were collected as part of the far-field station quality assurance/quality control sampling.

°C = degrees Celsius
EPA = U.S. Environmental Protection Agency
HDPE = high-density polyethylene
L = liter
MDL = method detection limit
mGBM = Modified Green Bay Method
NA = not analyzed
PCB = polychlorinated biphenyl
TSS = total suspended solids

Table 2-4
Off-season Water Sample Collection, Handling, and Analysis Summary

Station	Analyte	Container Specifications	Preservation	Analytical Method	Turnaround Time[1]	Holding Time[2]
Bakers Falls	Low-level mGBM PCBs	(2) 4-L amber glass bottles	Cool, 4°C +/- 2°C	Low MDL mGBM	Standard	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	Standard	7 days
Rogers Island	Low-level mGBM PCBs	(2) 4-L amber glass bottles	Cool, 4°C +/- 2°C	Low MDL mGBM	Standard	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	Standard	7 days
Thompson Island, Schuylerville, Waterford	Aroclor PCBs	1-L amber glass bottle	Cool, 4°C +/- 2°C	Modified EPA 508	Standard	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	Standard	7 days
Albany, Poughkeepsie	Aroclor PCBs	1-L amber glass bottle	Cool, 4°C +/- 2°C	Modified EPA 508	Standard	365 days to extraction, 40 days to analysis
	TSS	1-L HDPE plastic bottle	Cool, 4°C +/- 2°C	SM 2540D[3]	Standard	7 days

Notes:
1. Turnaround times (TATs) from verified time of sample receipt at laboratory. Standard TAT is 20 business days.
2. Holding time starts on the date of collection.
3. Modified to be consistent with American Society for Testing and Materials (ASTM) Method D3977-97.

°C = degrees Celsius
EPA = U.S. Environmental Protection Agency
HDPE = high-density polyethylene
L = liter
MDL = method detection limit
mGBM = Modified Green Bay method
PCB = polychlorinated biphenyl
TSS = total suspended solids

Table 2-5

Fish RAMP Sampling Locations and Number of Each Species Per Location (2013 Spring Sampling)

Location		Site Code	SMB/LMB Size (TL) >305 mm	BB/YB CHC >200 mm	YP/WP >170 mm / >160 mm	Striped Bass >450 mm	Total	Sample Date	Shocking Seconds	Comments
			Actual Number of Adult Fish							
Feeder Dam		FD1	20	20	20		**60**	June 13, 2013	5833	
Feeder Dam Totals			***20***	***20***	***20***		***60***			
Upstream	Thompson Island Pool	TD1	5	5	5		**15**	May 29, 2013 June 4, 2013 June 26, 2013	7928 5247 1220	May 29 - Sampled entire area around Rogers Island, very little veg; conductivity lower than normal. June 4 - Collected 3 additional bullhead. June 26 - Collected remaining 1 bullhead.
	Thompson Island Pool	TD2	5	5	5		**15**	May 29, 2013 June 4, 2013 June 26, 2014	3117 1932 1982	May 29- Very little habitat. June 4 - Only 2 additional perch. June 26 - Collected 4 bullhead, 1 perch, 1 bass
	Thompson Island Pool	TD3	6	5	5		**16**	May 29, 2013 June 4, 2013	4930 600	May 29 - Sampled all around islands. June 4 - Collected remaining bullhead
	Thompson Island Pool	TD4	5	5	3		**13**	May 29, 2013 June 4, 2013 June 26, 2016	1305 1466 1443	May 29 - Very little habitat for perch and bullhead. June 4 - Collected 4 bullhead and 1 perch, observed 1 herring. June 26 - Collected one more perch, none others observed along entire site.
Downstream	Thompson Island Pool[1]	TD5	10	12	14		**36**	May 29, 2013	2078	Backfill occurring in area, very turbid and difficult to see. Many fish still observed and extra fish collected to make up for other sites in TIP.
Thompson Island Pool Totals			***31***	***32***	***32***		***95***			
Upstream	Ft. Miller/Northumberland Pools (LL section)	ND1	5	5	5		**15**	May 30, 2013 June 26, 2013	6200 2205	May 30 - Very little veg. yet making it difficult to find any perch - none of any size observed. June 26 - Collected remaining perch from between islands.
	Ft. Miller/Northumberland Pools (LL section)	ND2	5	5	5		**15**	May 30, 2013 June 26, 2014	2950 1774	May 30 - No bullhead or perch observed. June 26 - Collected bullhead and perch.
	Ft. Miller/Northumberland Pools	ND3	5	5	5		**15**	May 30, 2013	1620	Sampled just below Lock 6 in rapids and in cove on east shoreline. Dredging occurring below Lock 6 on east shoreline.
Downstream	Ft. Miller/Northumberland Pools	ND5	10	10	10		**30**	May 30, 2013	1737	Sampled in cove and around island upstream of bridge.
Ft. Miller/Northumberland Pools Totals			***25***	***25***	***25***		***75***			
Upstream	Stillwater Pool	SW1	5	5	5		**15**	May 30, 2013 June 4, 2013 June 26, 2014	2948 3140 1680	May 30 - Water high and turbid; difficult to see. June 4 - Turbidity better; collected one additional bullhead; observed several herring at mouth of Battenkill. June 26 - Collected remaining 3 bullhead.
	Stillwater Pool	SW2	5	5	5		**15**	May 31, 2013 June 27, 2013	4760 1549	May 31 - Sampled along both shorelines; water turbid making it difficult to see. June 27 - Collected remaining perch
	Stillwater Pool[2]	SW3	10	10	10		**30**	May 31, 2013	2848	Sampled from mouth of cove to launch area.
	Stillwater Pool	SW4	5	11	5		**21**	June 3, 2013 June 5, 2013 June 27, 2013	3813 2249 1860	June 3 - Sampled along eastern shoreline twice. Water very turbid following storms over weekend. No other perch observed of any size. June 5 - Collected remaining bass. Still no perch although vegetation is well established. June 27 - Collected remaining perch.
Downstream	Stillwater Pool	SW5	5	5	5		**15**	June 5, 2013	6464	Sampled along both shorelines. Vegetation much further advanced here than upstream.
Stillwater Pool Totals			***30***	***36***	***30***		***96***			
	Albany/Troy	AT1	20	20	20	20	**80**	May 28, 2013	NA	Sampled from 11:25 to 16:12. Shocking second counter not functioning, no seconds recorded.

Table 2-5

Fish RAMP Sampling Locations and Number of Each Species Per Location (2013 Spring Sampling)

Location		Site Code	SMB/LMB Size (TL) >305 mm	BB/YB CHC >200 mm	YP/WP >170 mm / >160 mm	Striped Bass >450 mm	Total	Sample Date	Shocking Seconds	Comments
			Actual Number of Adult Fish							
	Albany/Troy Totals		***20***	***20***	***20***	***20***	***80***			
	Catskill	CS	20	20		20	**60**	May 6, 2013 May 7, 2013	11058 7505	
	Catskill Totals		***20***	***20***		***20***	***60***			
	Tappan Zee	TZ				17	**17**	April 15, 2013 April 16, 2013 April 17, 2013	NA	April 15 - Charter fishing - collected 11 (2 boats). April 16 - Collected 6 (1 boat). April 17 - Collected 0 (1 boat).
Tappan Zee Totals						***17***	***17***			
Totals per Species			***146***	***153***	***127***	***57***	***483***			

Notes:

1. Historical New York State Department of Environmental Conservation (NYSDEC) location behind Griffin Island
2. Historical NYSDEC location near Coveville

BB = Black Bass, CHC = Channel Catfish, LMB = Largemouth Bass SMB = Smallmouth Bass, YB = Yellow Bullhead, YP = Yellow Perch, WP = White Perch
mm = millimeter
NA = not available
RVW = Rip Van Winkle
TL = Total Length
YP/WP = equal numbers of each at Albany/Troy (10 of each) when possible

Table 2-6
Fish RAMP Sampling Locations and Number of Each Species per Location (2013 Late Summer Sampling)

Location		Site Code	PSKD *70-130 mm* Number of Fish[2]	STS[1] Number of Fish[2]	Total	Sample Date	Shocking Seconds	Site Description	Notes
Feeder Dam		FD1	20	10	**30**	September 4, 2013	2563	Feeder Dam pool near boat launch	Collected all targeted numbers
Feeder Dam Total			***20***	***10***	***30***				
Upstream	Thompson Island Pool	TD1	5	2	**7**	September 4, 2013	370	Near Rogers Island	Collected all targeted numbers
	Thompson Island Pool	TD2	5	2	**7**	September 4, 2013	583	Near RM 193	Collected all targeted numbers
	Thompson Island Pool	TD3	5	2	**7**	September 4, 2013	1426	Just upstream of Snook Kill – behind three sisters islands on eastern shore	Collected all targeted numbers
	Thompson Island Pool	TD4	5	2	**7**	September 4, 2013	799	Northern end of Griffin Island	Collected all targeted numbers
Downstream	Thompson Island Pool[3]	TD5	10	2	**12**	September 4, 2013	1430	Near RM 190 – along eastern shoreline	Collected all targeted numbers
Thompson Island Pool Totals			***30***	***10***	***40***				
Upstream	Ft. Miller/Northumberland Pools (LL section)	ND1	5	2	**7**	September 3, 2013	1948	From Thompson Island to small island below	Collected all targeted numbers
	Ft. Miller/Northumberland Pools (LL section)	ND2	5	2	**7**	September 3, 2013	1956	Downstream end of pool	Collected all targeted numbers
	Ft. Miller/Northumberland Pools	ND3	5	2	**7**	September 3, 2013	754	Below Fort Miller dam to two small islands	Collected all targeted numbers
	Ft. Miller/Northumberland Pools	ND4			**0**			Abandoned	
Downstream	Ft. Miller/Northumberland Pools	ND5	10	4	**14**	August 13, 2013	3418	Wetland area above Northumberland Dam	Collected all targeted numbers
Ft. Miller/Northumberland Pools Totals			***25***	***10***	***35***				
Upstream	Stillwater Pool	SW1	5	2	**7**	September 3, 2013	1859	Below Lock 5	Collected all targeted numbers
	Stillwater Pool	SW2	5	2	**7**	September 4, 2013	565	Approximately 0.75 mile upstream of Coveville	Collected all targeted numbers
	Stillwater Pool	SW3	5	2	**7**	September 4, 2013	1615	Coveville	Collected all targeted numbers
	Stillwater Pool	SW4	5	2	**7**	September 5, 2013	309	Near RM 173	Collected all targeted numbers
Downstream	Stillwater Pool[4]	SW5	10	2	**12**	September 5, 2013	645	Just above Stillwater Dam	Collected all targeted numbers
Stillwater Totals			***30***	***10***	***40***				
Albany/Troy		AT1	11	6	**17**	September 5, 2013 September 17, 2013	8250 ~10,000	Between Dunn Memorial Bridge and Route 90 Bridge; second effort same area, shocking seconds not recording, sampled for 3 hours continuously	Sampled both shorelines; very little vegetation observed; short 9 pumpkinseed and 4 forage composites
Albany/Troy Totals			***11***	***6***	***17***				
Total by Species			***116***	***46***	***162***				

Notes:
1. Substitute species for Spottail Shiner include: Fallfish, Spotfin Shiner, Mimic Shiner, or Golden Shiner.
2. Number of composite samples for forage fish
3. Historical New York State Department of Environmental Conservation (NYSDEC) location across from Griffin Island (east channel)
4. Historical NYSDEC location near Stillwater Dam
mm = millimeter
PKSD = Pumpkinseed
RAMP = Remedial Action Management Program
RM = river mile
STS = Spottail Shiner
TL = Total Length

Table 3-1

Summary of 2013 Modified Green Bay Method Performance Evaluation Homolog and Total Performance Evaluation Results

Homolog Group	Performance Evaluation	Performance Evaluation Concentration (ng/L)	Lower Control Limit (70%R) (ng/L)	Upper Control Limit (130%R) (ng/L)	Weight Percent	Concentration (ng/L)	Percent Recovery
Monochlorobiphenyl	8-L	0.480	0.336	0.624	3.48%	0.283	59.1%
Dichlorobiphenyl	8-L	1.20	0.840	1.56	18.6%	1.51	126%
Trichlorobiphenyl	8-L	1.80	1.26	2.34	26.2%	2.13	119%
Tetrachlorobiphenyl	8-L	2.64	1.85	3.43	26.6%	2.16	82.1%
Pentachlorobiphenyl	8-L	1.44	1.01	1.87	17.7%	1.44	100%
Hexachlorobiphenyl	8-L	0.720	0.504	0.936	7.38%	0.600	83.6%
Total PCB	8-L	8.28	5.80	10.8		8.02	97.1%
Monochlorobiphenyl	1-L	11.8	8.24	15.3	4.22%	8.06	69.0%
Dichlorobiphenyl	1-L	29.4	20.6	38.2	17.6%	33.7	115%
Trichlorobiphenyl	1-L	44.1	30.9	57.4	26.4%	50.5	115%
Tetrachlorobiphenyl	1-L	64.7	45.3	84.1	25.9%	49.5	74.6%
Pentachlorobiphenyl	1-L	35.3	24.7	45.9	18.4%	35.1	99.1%
Hexachlorobiphenyl	1-L	17.6	12.4	22.9	7.41%	14.2	81.0%
Total PCB	1-L	203	142	264		188	92.5%

Notes:
ng/L = nanograms per liter
PCB = polychlorinated biphenyl
R = recovery

Table 3-2
2013 Summary of Modified Green Bay Method Performance Evaluation BZ 4 and BZ 10 Results

PCB Congener	Performance Evaluation	Performance Evaluation Concentration (ng/L)	Lower Control Limit (70%R) (ng/L)	Upper Control Limit (130%R) (ng/L)	Concentration (ng/L)	Percent Recovery
BZ 4	8-L	0.240	0.168	0.312	0.263	110%
BZ 10	8-L	0.240	0.168	0.312	0.256	107%
BZ 4	1-L	5.88	4.12	7.65	5.50	94%
BZ 10	1-L	5.88	4.12	7.65	6.26	106%

Notes:
ng/L = nanograms per liter
PCB = polychlorinated biphenyl
R = recovery

Table 3-3
2013 Downstream Deposition Study Sediment Performance Evaluation Processing Schedule

Week of	Performance Evalulation
8/19/2013	PE25
8/26/2013	PE26

Notes:
PE = performance evaluation

Table 3-4
Comparison of Parent and Duplicate Samples Collected Using Manual and Automated Samplers

Location	Start Time	Method	Total PCBs (ng/L)		TSS (mg/L)	
			Parent	Duplicate	Parent	Duplicate
TID	11/14/13 12:40 PM	MAN	10.98	13.33	1.72	1.82
	11/14/13 12:45 PM	ATM	9.69	15.97	1.80	1.79
L5	5/20/13 12:30 PM	MAN	313.59	310.02	5.20	4.02
	5/20/13 12:35 PM	ATM	239.30	229.47	3.63	3.65
	6/25/13 1:57 PM	MAN	732.98	712.44	5.00	5.30
	6/25/13 2:00 PM	ATM	481.87	445.64	12.40	6.30
	7/25/13 12:26 PM	ATM	214.14	222.65	5.60	5.79
	7/25/13 12:28 PM	MAN	282.31	275.74	8.00	8.32
	8/22/13 12:00 PM	MAN	365.38	381.41	7.00	5.65
	8/22/13 12:05 PM	ATM	217.13	213.65	5.00	5.13
	9/25/13 1:35 PM	MAN	412.71	442.22	12.00	12.10
	9/25/13 1:43 PM	ATM	357.24	347.95	14.20	12.60
	10/25/13 10:30 AM	MAN	61.36	54.10	4.95	5.05
	10/25/13 10:35 AM	ATM	62.16	93.97	6.60	6.98
	11/14/13 11:35 AM	MAN	25.97	25.01	5.20	4.95
	11/14/13 11:38 AM	ATM	33.99	56.04	5.15	5.68
STWA	6/25/13 9:34 AM	MAN	366.62	376.13	25.40	22.20
	6/25/13 9:40 AM	ATM	325.64	352.68	25.00	23.40
	7/25/13 9:33 AM	ATM	242.08	237.45	5.60	6.20
	7/25/13 9:36 AM	MAN	253.83	259.45	7.58	7.05
	8/22/13 9:30 AM	MAN	478.11	536.82	4.88	3.20
	8/22/13 9:35 AM	ATM	484.57	471.30	4.60	4.00
	9/25/13 11:55 AM	ATM	150.80	144.90	2.07	2.31
	9/25/13 12:05 AM	MAN	145.64	145.55	2.14	5.94
	10/25/13 11:50 AM	MAN	177.49	179.27	4.24	4.00
	10/25/13 11:55 AM	ATM	189.12	188.39	4.49	4.33
WAFA	5/20/13 2:50 PM	MAN	261.69	276.95	4.17	4.43
	5/20/13 2:55 PM	ATM	252.85	250.60	5.26	3.80
	6/25/13 10:46 AM	MAN	178.33	175.53	11.50	10.60
	6/25/13 10:46 AM	ATM	153.97	166.85	12.20	10.50
	7/25/13 10:30 AM	MAN	225.54	186.02	13.90	14.20
	7/25/13 10:31 AM	ATM	200.41	200.62	15.10	13.20
	8/22/13 10:30 AM	MAN	144.12	141.19	4.88	3.40
	8/22/13 10:35 AM	ATM	112.53	122.99	7.13	8.20
	9/25/13 10:42 AM	MAN	147.86	162.36	4.80	4.90
	9/25/13 10:58 AM	ATM	166.41	168.77	12.00	14.60
	10/25/13 12:50 PM	MAN	233.18	243.53	5.77	5.73
	10/25/13 1:08 PM	ATM	204.93	213.45	6.80	6.25
	11/14/13 10:20 AM	MAN	52.21	47.61	5.88	5.70
	11/14/13 10:23 AM	ATM	46.64	46.53	5.63	5.60

Notes:

1. MAN indicates a manual sample was colleced using the MADIS.
2. ATM indicates samples were collected from the ISCO sampler inside the station or on the buoy.
3. ND - Not detected at method detection limit.

Table 3-5
Summary of Percentage of Validated 2013 RAMP Water, DDS Sediment, and Fish Data

Analysis Fraction	Total ENV Samples		
	Number of ENV Samples	Number of ENV Samples Validated	Percent ENV Samples Validated
PCB mGBM in water (NE294_00/NE294_00A and NE293_00)	94	6	6.4%
Aroclor PCBs in water (NE273_02)	1205	81	6.7%
Total metals in water (200.8 SLCH)	6	2	33.3%
Dissolved metals in water (200.8 SL)	6	2	33.3%
Hardness in water (SM 2340B)	6	2	33.3%
Total suspended solids in water (SM 2540D)	1270	87	6.9%
Aroclor PCBs in sediment (GEHR8082)	74	0[1]	0.0%
Total organic carbon in sediment (Lloyd Kahn)	74	0[1]	0.0%
Aroclor PCBs in fish tissue (SW-846 8082/8082A, NE148_08)	636	40	6.3%
mGBM PCBs in fish tissue (NE013_10)	35	4	11.4%

Notes:

1. Aroclor PCB analysis by Standard Operating Procedure (SOP) GEHR8082 and total organic carbon by the Llokd Kahn method were also performed as part of the residual sediments and backfill/capping programs. The overall GEHR8082 validation percentage of 5% was met for all the programs combined. The first two SDGs of TOC data, which are the only TOC data to require validation, were associated with the backfill/capping sampling program.

ENV = environmental
mGBM = Modified Green Bay Method
PCB = polychlorinated biphenyl
RAMP = Remedial Action Monitoring Program

Table 4-1
Near-field Program PCB and TSS Summary Statistics

Location	Sample Counts		Detect	Non-detect	Minimum	Average	Maximum
	ENV	DUP					
Aroclor PCBs (ng/L) Near-field							
RM176.10-Monitoring Transect	35	1	36	0	29.5	206.3	427.4
RM180.70-Monitoring Transect	28	2	30	0	30.8	74.5	299.8
RM181.00-Monitoring Transect	118	6	124	0	17.6	247.2	576.1
RM182.00-Monitoring Transect	14	1	15	0	28.0	312.1	747.3
RM182.30-Monitoring Transect	10	1	11	0	133.4	398.0	486.0
RM183.80-Monitoring Transect	13	2	15	0	96.3	257.6	632.0
RM184.80-Monitoring Transect	13	2	15	0	84.9	357.8	740.0
RM185.40-Monitoring Transect	67	10	77	0	73.8	464.5	1762.0
RM187.50-Monitoring Transect	193	28	210	11	10.4	50.7	301.7
RM190.10-Background Buoy	149	1	72	78	10.8	20.9	60.0
RM191.50-Background Buoy	27	0	0	27	--	--	--
Total mGBM PCBs (ng/L) Background Buoy							
RM190.10-Background Buoy	5	1	6	0	6.1	12.7	17.9
RM191.50-Background Buoy	1	0	1	0	6.3	6.3	6.3
TSS (mg/L) Near-field							
RM176.10-Monitoring Transect	35	1	36	0	1.1	8.4	57.0
RM180.70-Monitoring Transect	28	2	27	3	1.1	4.5	10.6
RM181.00-Monitoring Transect	118	5	120	3	1.1	9.0	108.0
RM182.00-Monitoring Transect	14	1	14	1	1.2	12.9	85.5
RM182.30-Monitoring Transect	10	1	11	0	1.5	4.1	10.9
RM183.80-Monitoring Transect	13	2	14	1	1.3	5.6	12.7
RM184.80-Monitoring Transect	13	2	14	1	2.1	7.4	12.1
RM185.40-Monitoring Transect	67	10	74	3	0.9	11.1	97.3
RM187.50-Monitoring Transect	193	28	188	33	0.8	7.4	95.3
RM190.10-Background Station	152	0	141	11	1.2	3.9	23.7
RM191.50-Background Station	28	0	28	0	1.5	10.8	93.3

Notes:

Duplicate samples are averaged with parent samples.

Statistics are based on detected results only.

DUP = duplicate

ENV = environmental

mg/L = milligrams per liter

mGBM = Modified Green Bay Method

ng/L = nanograms per liter

PCB = polychlorinated biphenyl

TSS = total suspended solids

Table 4-2
Near-field Program Metals Summary Statistics

Location	Sample Counts		Detect	Non-detect	Minimum	Average	Maximum
	ENV	DUP					
Dissolved TAL – Cadmium (µg/L)							
RM185.40-Monitoring Transect	6	1	0	8	ND	ND	ND
Dissolved TAL – Lead (µg/L)							
RM185.40-Monitoring Transect	6	1	6	2	0.20	0.40	1.00
TAL – Cadmium (µg/L)							
RM185.40-Monitoring Transect	6	1	1	7	0.09	0.09	0.09
TAL – Calcium (µg/L)							
RM185.40-Monitoring Transect	6	1	7	1	7360	9130	11800
TAL – Lead (µg/L)							
RM185.40-Monitoring Transect	6	1	6	2	0.69	1.02	1.80
TAL – Magnesium (µg/L)							
RM185.40-Monitoring Transect	6	1	7	1	1230	1440	1640

Notes:
Duplicate samples are averaged with parent samples.
Statistics are based on detected results only.
µg/L = micrograms per liter
DUP = duplicate
ENV = environmental
TAL = target analyte list

Table 4-3
Near-field Program Water Quality Parameter Summary Statistics

Operation	Monitoring Role	Parameter	Average	Minimum	Maximum	Standard Deviation	Units
CU49-60: 1	Background Buoy Location	Dissolved Oxygen	9.14	6.67	12.3	0.990	mg/L
CU49-60: 1	Background Buoy Location	pH	7.75	7.24	8.55	0.270	SU
CU49-60: 1	Background Buoy Location	Turbidity	6.78	1.40	156	8.67	NTU
CU49-60: 1	Near-field Monitoring Transect	Dissolved Oxygen	7.97	7.33	8.60	0.270	mg/L
CU49-60: 1	Near-field Monitoring Transect	pH	7.49	7.06	8.69	0.260	SU
CU49-60: 1	Near-field Monitoring Transect	Turbidity	5.69	0.1	162	6.05	NTU
CU50-54: 1	Background Buoy Location	Dissolved Oxygen	9.25	8.16	10.7	0.670	mg/L
CU50-54: 1	Background Buoy Location	pH	7.94	7.40	8.55	0.340	SU
CU50-54: 1	Background Buoy Location	Turbidity	10.2	2.40	156	11.9	NTU
CU67-70: 1	Background Buoy Location	Dissolved Oxygen	9.14	6.67	12.3	0.990	mg/L
CU67-70: 1	Background Buoy Location	pH	7.75	7.24	8.55	0.270	SU
CU67-70: 1	Background Buoy Location	Turbidity	6.78	1.40	156	8.67	NTU
CU67-70: 1	Near-field Monitoring Transect	Dissolved Oxygen	8.92	6.27	14.9	0.920	mg/L
CU67-70: 1	Near-field Monitoring Transect	pH	7.50	6.82	8.69	0.240	SU
CU67-70: 1	Near-field Monitoring Transect	Turbidity	14.5	0.0	167	18.2	NTU
CU72-73: 1	Background Buoy Location	Dissolved Oxygen	9.12	6.67	12.3	1.05	mg/L
CU72-73: 1	Background Buoy Location	pH	7.71	7.24	8.36	0.240	SU
CU72-73: 1	Background Buoy Location	Turbidity	6.04	1.40	126	7.58	NTU
CU72-73: 1	Near-field Monitoring Transect	Dissolved Oxygen	8.59	6.27	14.9	0.810	mg/L
CU72-73: 1	Near-field Monitoring Transect	pH	7.52	6.85	8.69	0.260	SU
CU72-73: 1	Near-field Monitoring Transect	Turbidity	16.0	0.1	167	17.8	NTU
CU74-77: 1	Background Buoy Location	Dissolved Oxygen	9.12	6.67	12.3	1.05	mg/L
CU74-77: 1	Background Buoy Location	pH	7.71	7.24	8.36	0.240	SU
CU74-77: 1	Background Buoy Location	Turbidity	6.04	1.40	126	7.58	NTU
CU74-77: 1	Near-field Monitoring Transect	Dissolved Oxygen	8.96	6.27	14.9	0.960	mg/L
CU74-77: 1	Near-field Monitoring Transect	pH	7.56	6.85	8.60	0.260	SU
CU74-77: 1	Near-field Monitoring Transect	Turbidity	17.6	0.1	167	19.0	NTU
CU78: 1	Background Buoy Location	Dissolved Oxygen	9.14	6.67	12.3	0.990	mg/L
CU78: 1	Background Buoy Location	pH	7.75	7.24	8.55	0.270	SU
CU78: 1	Background Buoy Location	Turbidity	6.78	1.40	156	8.67	NTU
CU78: 1	Near-field Monitoring Transect	Dissolved Oxygen	8.64	6.27	14.9	0.740	mg/L

Table 4-3
Near-field Program Water Quality Parameter Summary Statistics

Operation	Monitoring Role	Parameter	Average	Minimum	Maximum	Standard Deviation	Units
CU78: 1	Near-field Monitoring Transect	pH	7.54	6.85	8.27	0.270	SU
CU78: 1	Near-field Monitoring Transect	Turbidity	17.9	0.500	167	19.7	NTU
CU-79: 1	Background Buoy Location	Dissolved Oxygen	9.12	6.67	12.3	1.05	mg/L
CU-79: 1	Background Buoy Location	pH	7.71	7.24	8.36	0.240	SU
CU-79: 1	Background Buoy Location	Turbidity	6.04	1.40	126	7.58	NTU
CU-79: 1	Near-field Monitoring Transect	Dissolved Oxygen	10.0	8.4	12.4	0.760	mg/L
CU-79: 1	Near-field Monitoring Transect	pH	7.7	7.2	8.6	0.230	SU
CU-79: 1	Near-field Monitoring Transect	Turbidity	14.3	0.1	166.2	14.8	NTU
CU82-84: 1	Background Buoy Location	Dissolved Oxygen	9.12	6.67	12.3	1.05	mg/L
CU82-84: 1	Background Buoy Location	pH	7.7	7.2	8.4	0.240	SU
CU82-84: 1	Background Buoy Location	Turbidity	6.0	1.4	125.8	7.58	NTU
CU82-84: 1	Near-field Monitoring Transect	Dissolved Oxygen	10.0	8.4	12.4	0.810	mg/L
CU82-84: 1	Near-field Monitoring Transect	pH	7.75	7.50	8.44	0.190	SU
CU82-84: 1	Near-field Monitoring Transect	Turbidity	10.3	1.0	166.2	14.8	NTU

Notes:

mg/L = miligrams per liter

NTU = nephelometric turbidity units

SU = standard units

TID = Thompson Island Dam

Table 4-4
Far-field, Off-season, and High Flow Program PCB and TSS Summary Statistics

Location	Sample Counts		Detect	Non-Detect	Minimum	Average	Maximum
	ENV	DUP					
PCBs (ng/L) Far-field							
Bakers Falls	6	0	0	6	ND	ND	ND
Rogers Island	10	0	9	1	1.29	1.83	2.72
Lock 5[1]	40	4	42	2	31.5	251	879
Stillwater	180	16	196	0	31.0	209	562
Waterford	196	15	209	2	19.2	148	439
Green Island-RM153	22	1	23	0	10.5	41.6	125
Albany	21	1	21	1	18.0	77.0	187
Poughkeepsie	6	1	5	2	11.7	57.1	103
TSS (mg/L) Far-field							
Bakers Falls	7	0	7	0	1.30	1.90	3.96
Rogers Island	10	1	10	1	1.20	1.53	2.16
Lock 5	40	4	41	0	2.00	11.4	67.5
Stillwater	180	15	192	3	1.09	9.76	129
Waterford	196	14	209	1	1.03	27.3	388
Green Island-RM153	22	1	22	1	1.37	7.09	24.0
Albany	21	1	21	1	1.51	12.9	83.2
Poughkeepsie	6	1	7	0	6.50	31.9	106
PCBs (ng/L) Off-season							
Bakers Falls	1	0	0	1	ND	ND	ND
Rogers Island	1	0	0	1	ND	ND	ND
Thompson Island Automated	25	4	4	25	9.84	12.3	16.5
Lock 5	15	5	9	11	11.1	27.7	69.6
Waterford	25	2	12	15	14.9	20.3	27.5
Albany	2	0	1	1	16.7	16.7	16.7
Poughkeepsie	2	0	1	1	32.4	32.4	32.4
TSS (mg/L) Off-season							
Bakers Falls	1	0	0	1	ND	ND	ND
Rogers Island	1	0	1	0	1.63	1.63	1.63
Thompson Island Automated	25	4	23	6	1.13	5.31	50.8
Lock 5	17	5	20	2	2.25	7.42	24.4
Waterford	25	2	25	2	1.10	14.1	75.5
Albany	2	0	2	0	8.00	9.70	11.4
Poughkeepsie	2	0	2	0	9.00	18.6	28.2
PCBs (ng/L) High Flow							
Lock 5	2	0	2	0	20.8	22.7	24.6
Waterford	2	1	3	0	22.2	125	214
TSS (mg/L) High Flow							
Lock 5	2	0	2	0	12.0	13.8	15.5
Waterford	2	1	3	0	25.6	188	349

Notes:

1. Lock 5 includes both compliance and informational samples.
2. Duplicate samples are averaged with parent samples.
3. Statistics are based on detected results only.
4. Bakers Falls and Rogers Island were analyzed for congener-specific PCBs by the mGBM.
5. Lock 5 data contains both compliance and informational results.
6. The Bakers Falls sample collected on October 15 was removed as a result of QA/QC review.
7. ND - non detected at method detection limit.

mg/L = milligrams per liter
ng/L = nanograms per liter
PCB = polychlorinated biphenyl
TSS = total suspended solid

Table 4-5
Far-field Program Water Quality Parameter Summary Statistics

Location	Parameter	Minimum	Average	Maximum	Units
WFF-LOC5	Dissolved Oxygen	6.00	7.45	11.9	mg/L
WFF-LOC5	pH	6.30	7.33	8.35	pH
WFF-LOC5	Specific Conductance	0.066	0.107	0.155	µs/cm
WFF-LOC5	Turbidity	2.70	11.3	162.7	NTU
WFF-LOC5	Water Temperature	6.51	19.4	27.8	°C
WFF-STWA	Dissolved Oxygen	4.32	9.12	12.7	mg/L
WFF-STWA	pH	7.01	7.58	8.20	pH
WFF-STWA	Specific Conductance	0.092	0.139	0.195	µs/cm
WFF-STWA	Turbidity	1.96	20.4	147.0	NTU
WFF-STWA	Water Temperature	7.72	18.8	26.2	°C
WFF-WAFA	Dissolved Oxygen	6.00	7.62	12.2	mg/L
WFF-WAFA	pH	6.31	7.48	7.93	pH
WFF-WAFA	Specific Conductance	0.040	0.194	0.334	µs/cm
WFF-WAFA	Turbidity	0.000	35.3	166.8	NTU
WFF-WAFA	Water Temperature	6.68	19.8	29.0	°C

Table 4-6

Results of Grain Size Analysis, Total Organic Carbon, Total PCBs, and Tri+ PCBs for Surface Sediment Samples

Sample Name	Clay (%)	Silt (%)	Fine Sand (%)	Medium Sand (%)	Coarse Sand (%)	Gravel (%)	Total Organic Carbon (mg/kg)	Total PCBs (mg/kg)	Tri+ PCBs (mg/kg)
SSC-RS3-5554-322-000002	0.3	15	8.5	43.8	27.8	4.6	2900	1.51	0.98
SSC-RS3-5554-323-000002	13.5	64.3	20.9	0.9	0.4	0	18000	0.02	0.04
SSC-RS3-5554-C374-000000	18.7	55.8	22.5	0.4	0.3	2.3	15000	0.02	0.04
SSC-RS3-5756-C332-000000	10.1	52	36.5	0.6	0.5	0.3	20000	1.07	0.61
SSC-RS3-5857-321-000002	12.7	68.9	17.4	0.7	0.3	0	19000	0.53	0.28
SSC-RS3-5857-C320-000000	4.2	26.1	67.9	0.7	0.4	0.7	9300	1.07	0.60
SSC-RS3-5958-C317-000000	19.8	48.6	30.1	1.2	0.3	0	17000	0.83	0.52
SSC-RS3-5958-C369-000000	9.4	58.8	31.2	0.4	0.2	0	14000	0.44	0.23
SSC-RS3-6059-379-000002	14.1	66.3	19	0.4	0.1	0.1	22000	1.15	0.79
SSC-RS3-6160-313-000002	15.3	65.9	18.5	0.2	0.1	0	13000	0.46	0.28
SSC-RS3-6160-330-000002	4.7	8.3	15.8	3.7	7	60.5	13000	0.17	0.10
SSC-RS3-6362-324-000002	6.8	27.4	64.2	1	0.6	0	18000	1.18	0.63
SSC-RS3-6463-414-000002	5.6	21.9	67.8	3.1	0.9	0.7	27000	0.52	0.27
SSC-RS3-6665-329-000002	4	11.7	81.15	2.7	0.25	0.2	11000	0.85	0.51
SSC-RS3-6766-417-000002	5.65	28.8	60.15	4.35	0.45	0.6	17500	4.84	2.57
SSC-RS3-6766-418-000002	10.55	44.8	41.65	2	0.75	0.25	32500	3.75	2.51
SSC-RS3-6766-C303-000000	5.4	38.9	48.3	4.3	2	1.1	25000	2.04	0.95
SSC-RS3-6766-C304-000000	6.7	19.3	64.8	3.6	2.3	3.3	11000	0.42	0.24
SSC-RS3-6766-C305-000000	7.3	17	39.5	7.2	4.3	24.8	12000	0.63	0.31
SSC-RS3-6867-C328-000000	6.1	15.7	32	25.7	6.7	13.8	51000	0.02	0.03
SSC-RS3-6968-C301-000000	17.8	47.4	31.4	2.4	1	0	25000	2.30	1.27
SSC-RS3-6968-C302-000000	18.9	64.2	15.5	0.3	0.4	0.7	31000	1.48	0.66
SSC-RS3-7069-C294-000000	8.3	37.3	46.5	3.1	1	3.8	17000	0.55	0.26
SSC-RS3-7069-C295-000000	12.3	36.2	34.7	11.6	2.7	2.5	12000	0.99	0.61
SSC-RS3-7069-C299-000000	15.8	35.5	27.6	12.1	3.6	5.4	20000	6.11	2.42
SSC-RS3-7069-C361-000000	0.4	2.4	42.5	51.5	1.8	1.4	1300	0.61	0.39
SSC-RS3-7170-288-000002	1.8	1.7	63.6	32.9	0.1	0	2100	0.29	0.20
SSC-RS3-7170-293-000002	6.9	13.8	38.5	38	1.6	1.2	2500	0.44	0.21
SSC-RS3-7170-C287-000000	11.9	63.2	23.3	1.3	0.3	0	8400	1.33	0.66
SSC-RS3-7170-C289-000000	15.3	64.3	19.8	0.3	0.3	0	25000	1.47	0.70
SSC-RS3-7170-C291-000000	9.9	42.8	45.8	1	0.2	0.3	22000	0.69	0.32
SSC-RS3-7271-279-000002	16.5	60.4	21.9	0.3	0.6	0.3	33000	1.21	0.61
SSC-RS3-7271-C277-000000	3.3	8	64.7	23.5	0.3	0.2	8400	0.36	0.17
SSC-RS3-7271-C278-000000	0.4	4	40	52.8	2.3	0.5	1600	0.72	0.48
SSC-RS3-7271-C280-000000	27	63.6	8.4	0.5	0.5	0	31000	0.82	0.36
SSC-RS3-7271-C283-000000	4.5	8	39.8	39.4	3	5.3	14000	0.84	0.46

Table 4-6

Results of Grain Size Analysis, Total Organic Carbon, Total PCBs, and Tri+ PCBs for Surface Sediment Samples

Sample Name	Clay (%)	Silt (%)	Fine Sand (%)	Medium Sand (%)	Coarse Sand (%)	Gravel (%)	Total Organic Carbon (mg/kg)	Total PCBs (mg/kg)	Tri+ PCBs (mg/kg)
SSC-RS3-7372-272-000002	11.2	44.1	31	7.1	3.9	2.7	28000	1.11	0.55
SSC-RS3-7372-C273-000000	17.7	57.1	12.4	10.1	0.9	1.8	22000	0.69	0.33
SSC-RS3-7372-C274-000000	13.6	41.3	44.2	0.6	0.1	0.2	18000	2.57	1.04
SSC-RS3-7372-C275-000000	1.1	1.6	69.25	27.6	0.2	0.25	1600	0.35	0.22
SSC-RS3-7372-C276-000000	17.2	55.8	26.3	0.5	0.2	0	20000	0.96	0.45
SSC-RS3-7372-C352-000000	18.7	51.6	28.3	1.3	0.1	0	28000	3.69	1.22
SSC-RS3-7473-C267-000000	11.4	45.5	41.3	1.3	0.5	0	23000	1.87	1.00
SSC-RS3-7473-C268-000000	6.1	37.2	53.9	0.8	0.5	1.5	11000	0.69	0.34
SSC-RS3-7574-264-000002	7.4	11.7	14.8	9.8	17.4	38.9	17000	0.88	0.40
SSC-RS3-7574-265-000002	17.3	57.5	22.7	0.7	0.7	1.1	32000	2.51	1.22
SSC-RS3-7574-C263-000000	15.5	57.4	25.7	0.6	0.4	0.4	21000	1.12	0.49
SSC-RS3-7574-C266-000000	12.5	45.7	38	1.4	1.1	1.3	21000	1.75	0.83
SSC-RS3-7574-C349-000000	21.6	45.7	29.4	1.8	1.2	0.3	36000	1.32	0.53
SSC-RS3-7574-C396-000000	4.7	14.1	31.7	41.4	3.1	5	6100	1.88	0.87
SSC-RS3-7675-258-000002	20.2	69.7	9.4	0.2	0.5	0	30000	1.59	0.80
SSC-RS3-7675-C257-000000	3.4	16	41.6	38.1	0.6	0.3	6900	0.47	0.22
SSC-RS3-7675-C260-000000	5.4	10.6	27.3	48.7	7.3	0.7	17000	1.56	0.70
SSC-RS3-7675-C262-000000	7.7	47.7	42.8	0.7	0.3	0.8	21000	0.73	0.32
SSC-RS3-7675-C398-000000	6.8	29.6	55	8.4	0.2	0	12000	0.86	0.41
SSC-RS3-7776-C251-000000	1.1	4.95	41.55	42.7	6.3	3.45	5700	1.23	0.77
SSC-RS3-7776-C252-000000	10.5	67.2	20.3	1.3	0.3	0.4	9500	0.56	0.26
SSC-RS3-7776-C253-000000	15.1	58.2	25.5	0.9	0.3	0	38000	3.18	1.70
SSC-RS3-7877-C249-000000	2.15	9.85	32.9	30.4	3.85	20.85	18500	1.81	1.07
SSC-RS3-7877-C250-000000	8.6	42.5	47.5	1.3	0.1	0	21000	1.70	1.02
SSC-RS3-7978-247-000002	22.3	71.5	5.1	0.3	0.1	0.7	38000	1.57	0.81
SSC-RS3-7978-338-000002	13.1	50.9	33.1	1	0.6	1.3	27000	2.81	1.27
SSC-RS3-7978-C243-000000	7.3	50.5	40.8	1.1	0.4	0	22000	7.18	3.51
SSC-RS3-7978-C245-000000	8.1	47	43	0.6	0.2	1.1	25000	1.87	0.80
SSC-RS3-7978-C246-000000	9.3	27.5	61.2	1.2	0.1	0.7	14000	0.75	0.37
SSC-RS3-8079-240-000002	6.6	51.2	40.2	1.6	0.3	0.1	20000	1.02	0.46
SSC-RS3-8079-C237-000000	9.1	37.7	41.6	7.9	1.6	2.1	33000	2.65	1.43
SSC-RS3-8180-230-000002	8.2	61	29.7	0.7	0.4	0	25000	0.46	0.21
SSC-RS3-8180-234-000002	8.2	50.1	39.8	1.3	0.6	0	36000	3.90	1.66
SSC-RS3-8180-408-000002	9.2	38.2	51.1	1.4	0.2	0	30000	4.00	1.83
SSC-RS3-8180-C231-000000	4.9	23.8	61.6	4.3	1.3	4.1	30000	1.55	0.74
SSC-RS3-8180-C409-000000	5.5	19.7	59.3	4	4.7	6.8	21000	1.64	0.66

Table 4-6

Results of Grain Size Analysis, Total Organic Carbon, Total PCBs, and Tri+ PCBs for Surface Sediment Samples

Sample Name	Clay (%)	Silt (%)	Fine Sand (%)	Medium Sand (%)	Coarse Sand (%)	Gravel (%)	Total Organic Carbon (mg/kg)	Total PCBs (mg/kg)	Tri+ PCBs (mg/kg)
SSC-RS3-8281-228-000002	5.5	47.9	42	1.6	1.3	1.7	31000	3.71	1.95
SSC-RS3-8281-410-000002	1	1.1	10.8	11.2	5.1	70.8	20000	1.81	1.14
Minimum	0.30	1.10	5.10	0.20	0.10	0.00	1300	0.02	0.03
Maximum	27.00	71.50	81.15	52.80	27.80	70.80	51000	7.18	3.51
Average	9.83	37.96	36.81	9.38	1.92	4.11	19714	1.51	0.76

Notes:

1. mg/kg - miligrams per kilogram
2. Duplicate samples are averaged with parent samples.
3. Non-detects were set to zero for Aroclor PCBs congeners used in Tri+ PCBs calculation.

Non-detects for Total PCBs were set to one half the MDL.

All other analytical results are above the laboratory detection limit.

Table 4-7
Aroclor PCB Summary Statistics for Black Bass

Species	Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Largemouth Bass	Feeder Dam	1	3	0.01	ND	ND	-
	Thompson Island Pool	2	1	6.09	6.09	6.09	-
	Thompson Island Pool	3	1	1.28	1.28	1.28	-
	Thompson Island Pool	4	3	1.49	1.09	1.97	0.51
	Thompson Island Pool	5	9	2.36	0.47	3.74	0.83
	Northumberland/Fort Miller	2	1	0.42	0.42	0.42	-
	Northumberland/Fort Miller	3	2	2.21	1.87	2.55	0.68
	Northumberland/Fort Miller	5	8	1.93	0.73	3.97	0.72
	Stillwater	1	1	4.40	4.40	4.40	-
	Stillwater	2	2	2.01	1.01	3.02	2.01
	Stillwater	3	10	1.67	0.49	2.50	0.39
	Stillwater	4	1	1.07	1.07	1.07	-
	Stillwater	5	3	0.60	0.38	0.88	0.30
	Catskill	1	4	0.64	0.21	1.15	0.48
Smallmouth Bass	Feeder Dam	1	17	0.03	ND	0.38	0.04
	Thompson Island Pool	1	5	2.93	1.09	4.58	1.42
	Thompson Island Pool	2	4	1.97	0.83	2.91	0.99
	Thompson Island Pool	3	4	3.64	2.15	5.19	1.30
	Thompson Island Pool	4	2	3.02	2.99	3.04	0.05
	Thompson Island Pool	5	1	4.66	4.66	4.66	-
	Northumberland/Fort Miller	1	5	3.16	1.44	5.16	1.52
	Northumberland/Fort Miller	2	4	2.38	1.08	2.92	0.88
	Northumberland/Fort Miller	3	3	2.53	1.21	3.40	1.34
	Northumberland/Fort Miller	5	2	4.33	2.79	5.87	3.08
	Stillwater	1	4	2.33	1.94	2.81	0.38
	Stillwater	2	3	1.89	1.75	2.10	0.21
	Stillwater	4	4	1.75	0.97	2.36	0.62
	Stillwater	5	2	0.90	0.81	0.99	0.18
	Albany/Troy	1	20	1.29	0.25	2.92	0.34
	Catskill	1	16	0.55	0.09	2.54	0.31

Notes:
Prep – fillet
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-8
Congener-specific PCB Summary Statistics for Black Bass

Species	Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Smallmouth Bass	Feeder Dam	1	1	0.03	0.03	0.03	-
	Thompson Island Pool	2	1	0.87	0.87	0.87	-
	Stillwater	1	1	1.95	1.95	1.95	-
	Albany/Troy	1	1	0.60	0.60	0.60	-
	Catskill	1	1	0.29	0.29	0.29	-

Notes:
Prep – fillet
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-9
Aroclor PCB Summary Statistics for Ictalurids

Species	Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Brown Bullhead	Feeder Dam	1	20	0.04	ND	0.18	0.02
	Thompson Island Pool	1	5	3.25	2.03	4.14	0.84
	Thompson Island Pool	2	3	3.69	1.79	6.55	2.91
	Thompson Island Pool	3	5	2.99	1.06	4.61	1.57
	Thompson Island Pool	4	3	3.34	3.16	3.61	0.27
	Thompson Island Pool	5	10	5.26	2.31	7.92	1.28
	Northumberland/Fort Miller	1	4	4.30	3.23	6.97	1.80
	Northumberland/Fort Miller	2	4	4.42	1.61	7.10	2.51
	Northumberland/Fort Miller	3	5	4.93	2.16	10.34	2.85
	Northumberland/Fort Miller	5	10	4.83	1.91	16.45	2.93
	Stillwater	1	3	1.17	0.90	1.68	0.51
	Stillwater	2	5	2.00	1.61	2.31	0.26
	Stillwater	3	9	2.99	0.49	7.56	1.44
	Stillwater	4	5	1.67	0.58	3.50	1.30
	Stillwater	5	5	1.69	0.70	2.87	0.88
	Catskill	1	20	0.39	0.16	0.66	0.07
Channel Catfish	Albany/Troy	1	20	4.12	1.81	6.61	0.62
Yellow Bullhead	Thompson Island Pool	2	2	2.92	1.12	4.71	3.58
	Thompson Island Pool	4	2	3.68	1.87	5.50	3.63
	Northumberland/Fort Miller	1	1	2.22	2.22	2.22	-
	Northumberland/Fort Miller	2	1	4.42	4.42	4.42	-
	Stillwater	1	2	1.35	1.23	1.48	0.24
	Stillwater	3	1	0.82	0.82	0.82	-

Notes:
Prep – fillet
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-10
Congener-specific PCB Summary Statistics for Ictalurids

Species	Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Brown Bullhead	Feeder Dam	1	1	0.02	0.02	0.02	-
	Thompson Island Pool	3	1	2.50	2.50	2.50	-
	Thompson Island Pool	5	1	5.18	5.18	5.18	-
	Northumberland\Fort Miller	1	1	4.58	4.58	4.58	-
	Stillwater	3	1	1.08	1.08	1.08	-
	Catskill	1	1	0.17	0.17	0.17	-
Channel Catfish	Albany\Troy	1	1	2.58	2.58	2.58	-

Notes:
Prep – fillet
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-11
Aroclor PCB Summary Statistics for Perch

Species	Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
White perch	Albany/Troy	1	12	1.22	0.33	3.33	0.45
Yellow perch	Feeder Dam	1	20	0.02	ND	0.04	0.00
	Thompson Island Pool	1	5	0.46	0.26	0.61	0.14
	Thompson Island Pool	2	5	0.28	0.09	0.66	0.22
	Thompson Island Pool	3	5	1.34	0.90	1.89	0.33
	Thompson Island Pool	4	3	0.84	0.35	1.26	0.53
	Thompson Island Pool	5	12	1.70	0.80	2.87	0.37
	Northumberland/Fort Miller	1	5	1.32	1.03	1.57	0.23
	Northumberland/Fort Miller	2	5	0.87	0.32	1.25	0.33
	Northumberland/Fort Miller	3	5	2.34	1.30	3.77	0.87
	Northumberland/Fort Miller	5	10	1.53	0.72	2.40	0.36
	Stillwater	1	5	0.36	0.15	0.69	0.21
	Stillwater	2	5	0.72	0.58	0.82	0.09
	Stillwater	3	10	0.28	0.04	0.72	0.16
	Stillwater	4	5	0.50	0.39	0.69	0.11
	Stillwater	5	5	0.47	0.21	0.82	0.27
	Albany/Troy	1	8	0.24	0.03	0.47	0.11

Notes:
Prep – fillet
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-12
Congener-specific PCB Summary Statistics for Perch

Species	Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Yellow Perch	Feeder Dam	1	1	ND	ND	ND	-
	Thompson Island Pool	5	1	1.85	1.85	1.85	-
	Northumberland\Fort Miller	5	1	1.03	1.03	1.03	-
	Stillwater	3	1	0.31	0.31	0.31	-
	Stillwater	4	1	0.29	0.29	0.29	-
	Stillwater	5	1	0.54	0.54	0.54	-
	Albany\Troy	1	1	0.06	0.06	0.06	-

Notes:
Prep – fillet
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-13
Aroclor PCB Summary Statistics for Striped Bass

Species	Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Striped bass	Albany/Troy	1	20	1.11	0.08	5.72	0.60
	Catskill	1	20	0.42	ND	2.53	0.25
	Tappan Zee	1	17	0.73	0.12	4.71	0.53

Notes:
Prep – fillet
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-14
Congener-specific PCB Summary Statistics for Striped Bass

Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Albany\Troy	1	1	0.12	0.12	0.12	-
Catskill	1	2	0.35	0.29	0.41	0.12

Notes:
Prep – fillet
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-15
Aroclor PCB Summary Statistics for Pumpkinseed

Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Feeder Dam	1	20	0.04	ND	0.20	0.02
Thompson Island Pool	1	5	12.18	4.30	28.94	8.67
Thompson Island Pool	2	5	3.58	0.69	8.80	3.40
Thompson Island Pool	3	5	13.75	5.00	36.54	11.70
Thompson Island Pool	4	5	1.20	0.84	1.66	0.29
Thompson Island Pool	5	10	2.18	1.01	3.98	0.74
Northumberland/Fort Miller	1	5	8.21	3.42	13.89	3.41
Northumberland/Fort Miller	2	5	6.41	2.77	11.37	3.07
Northumberland/Fort Miller	3	5	5.90	3.42	9.93	2.34
Northumberland/Fort Miller	5	10	19.08	13.50	26.08	2.32
Stillwater	1	5	5.91	0.41	15.95	6.25
Stillwater	2	5	7.87	4.02	17.49	4.92
Stillwater	3	5	0.94	0.50	1.15	0.25
Stillwater	4	5	4.65	3.57	5.83	0.78
Stillwater	5	10	3.59	2.33	4.59	0.46
Albany/Troy	1	11	1.34	0.81	1.91	0.25

Notes:
Prep – whole body
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-16
Congener-specific PCB Summary Statistics for Pumpkinseed

Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Feeder Dam	1	1	0.08	0.08	0.08	-
Thompson Island Pool	5	1	1.72	1.72	1.72	-
Stillwater	3	1	0.80	0.80	0.80	-
Albany\Troy	1	2	1.15	1.05	1.26	0.21

Notes:
Prep – whole body
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-17
Aroclor PCB Summary Statistics for Forage Fish

Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Feeder Dam	1	10	0.04	ND	0.11	0.02
Thompson Island Pool	1	2	1.64	0.62	2.65	2.02
Thompson Island Pool	2	2	0.82	0.35	1.30	0.95
Thompson Island Pool	3	2	9.00	5.56	12.44	6.88
Thompson Island Pool	4	2	1.64	0.41	2.87	2.45
Thompson Island Pool	5	2	1.22	0.86	1.59	0.73
Northumberland/Fort Miller	1	2	5.71	4.87	6.55	1.68
Northumberland/Fort Miller	2	2	4.77	4.41	5.13	0.72
Northumberland/Fort Miller	3	2	15.67	9.74	21.60	11.87
Northumberland/Fort Miller	5	4	21.40	16.82	24.81	3.33
Stillwater	1	2	11.11	8.23	13.99	5.75
Stillwater	2	2	4.63	3.23	6.02	2.79
Stillwater	3	2	0.94	0.89	0.99	0.11
Stillwater	4	2	5.05	4.82	5.27	0.45
Stillwater	5	2	4.03	3.59	4.46	0.87
Albany/Troy	1	6	1.29	0.89	1.70	0.24

Notes:
Prep – whole body (composite)
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
Forage Fish = Golden Shiner, Spottail Shiner, Fallfish, Spotfin Shiner, and Mimic Shiner
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-18
Congener-specific PCB Summary Statistics for Forage Fish

Pool	Station Number	Count	Average (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	2 SE (mg/kg)
Feeder Dam	1	2	0.04	0.03	0.04	0.00
Thompson Island Pool	3	1	2.51	2.51	2.51	-
Stillwater	4	1	4.03	4.03	4.03	-
Albany\Troy	1	1	1.05	1.05	1.05	-

Notes:
Prep – whole body (composite)
Forage Fish = Golden Shiner, Spottail Shiner, Spotfin Shiner, Fallfish, and Mimic Shiner
Non-detect values were set to half of the method detection limit to calculate average and 2 SE.
mg/kg = milligrams per kilogram
ND = non-detect
PCB = polychlorinated biphenyl
SE = Standard Error

Table 4-19
Percent Lipid Summary Statistics for Black Bass

Species	Pool	Station Number	Count	Average %	Minimum %	Maximum %	2 SE %
Largemouth Bass	Feeder Dam	1	3	0.40	0.12	0.59	0.29
	Thompson Island Dam	2	1	0.60	0.60	0.60	-
	Thompson Island Dam	3	1	0.37	0.37	0.37	-
	Thompson Island Dam	4	3	0.34	0.23	0.57	0.23
	Thompson Island Dam	5	9	0.60	0.25	1.67	0.28
	Northumberland/Fort Miller	2	1	0.11	0.11	0.11	-
	Northumberland/Fort Miller	3	2	0.51	0.39	0.62	0.23
	Northumberland/Fort Miller	5	8	0.46	0.30	0.78	0.10
	Stillwater	1	1	0.49	0.49	0.49	-
	Stillwater	2	2	0.33	0.30	0.36	0.06
	Stillwater	3	10	0.31	0.17	0.45	0.07
	Stillwater	4	1	0.77	0.77	0.77	-
	Stillwater	5	3	0.21	0.13	0.29	0.10
	Catskill	1	4	0.99	0.48	1.84	0.65
Smallmouth Bass	Feeder Dam	1	17	0.65	0.24	1.22	0.12
	Thompson Island Dam	1	5	0.77	0.68	0.99	0.11
	Thompson Island Dam	2	4	0.59	0.37	0.92	0.23
	Thompson Island Dam	3	4	0.25	0.21	0.30	0.04
	Thompson Island Dam	4	2	0.18	0.15	0.20	0.05
	Thompson Island Dam	5	1	0.75	0.75	0.75	-
	Northumberland/Fort Miller	1	5	0.39	0.23	0.55	0.13
	Northumberland/Fort Miller	2	4	0.30	0.19	0.38	0.08
	Northumberland/Fort Miller	3	3	0.54	0.49	0.61	0.07
	Northumberland/Fort Miller	5	2	0.58	0.37	0.80	0.44
	Stillwater	1	4	0.56	0.39	0.65	0.12
	Stillwater	2	3	0.40	0.28	0.51	0.14
	Stillwater	4	4	0.60	0.46	0.74	0.12
	Stillwater	5	2	0.40	0.22	0.57	0.35
	Albany/Troy	1	20	0.92	0.15	2.10	0.26
	Catskill	1	16	0.71	0.17	2.27	0.32

Notes:
Prep – fillet
% = percent
SE = Standard Error

Table 4-20
Percent Lipid Summary Statistics for Ictalurids

Species	Pool	Station Number	Count	Average %	Minimum %	Maximum %	2 SE %
Brown Bullhead	Feeder Dam	1	20	0.93	0.52	2.32	0.19
	Thompson Island Pool	1	5	1.24	0.61	1.96	0.43
	Thompson Island Pool	2	3	1.79	1.55	2.17	0.39
	Thompson Island Pool	3	5	1.14	0.74	1.76	0.42
	Thompson Island Pool	4	3	1.05	0.74	1.30	0.33
	Thompson Island Pool	5	10	1.37	0.88	1.99	0.28
	Northumberland/Fort Miller	1	4	1.12	0.84	1.35	0.21
	Northumberland/Fort Miller	2	4	1.26	0.69	1.69	0.50
	Northumberland/Fort Miller	3	5	1.62	0.84	2.61	0.60
	Northumberland/Fort Miller	5	10	1.59	0.78	2.69	0.42
	Stillwater	1	3	0.81	0.45	1.21	0.44
	Stillwater	2	5	1.11	0.74	1.52	0.29
	Stillwater	3	9	1.71	0.61	3.35	0.56
	Stillwater	4	5	1.71	0.94	2.38	0.50
	Stillwater	5	5	1.23	0.77	1.66	0.33
	Catskill	1	20	1.38	0.42	2.83	0.24
Channel Catfish	Albany/Troy	1	20	7.00	2.90	12.40	1.14
Yellow Bullhead	Thompson Island Pool	2	2	1.47	1.26	1.68	0.42
	Thompson Island Pool	4	2	0.90	0.40	1.39	0.99
	Northumberland/Fort Miller	1	1	0.44	0.44	0.44	-
	Northumberland/Fort Miller	2	1	1.59	1.59	1.59	-
	Stillwater	1	2	0.63	0.32	0.95	0.63
	Stillwater	3	1	0.79	0.79	0.79	-

Notes:
Prep – fillet
% = percent
SE = Standard Error

Table 4-21
Percent Lipid Summary Statistics for Perch

Species	Pool	Station Number	Count	Average %	Minimum %	Maximum %	2 SE %
White Perch	Albany/Troy	1	12	1.60	0.81	2.36	0.28
Yellow Perch	Feeder Dam	1	20	0.62	0.40	1.13	0.08
	Thompson Island Pool	1	5	0.76	0.45	0.97	0.19
	Thompson Island Pool	2	5	0.42	0.16	0.76	0.24
	Thompson Island Pool	3	5	0.64	0.49	0.84	0.11
	Thompson Island Pool	4	3	0.40	0.11	0.86	0.47
	Thompson Island Pool	5	12	0.46	0.16	0.67	0.12
	Northumberland/Fort Miller	1	5	0.67	0.53	0.98	0.16
	Northumberland/Fort Miller	2	5	0.66	0.29	0.93	0.21
	Northumberland/Fort Miller	3	5	0.79	0.46	1.10	0.23
	Northumberland/Fort Miller	5	10	0.68	0.39	0.97	0.14
	Stillwater	1	5	0.44	0.27	0.53	0.09
	Stillwater	2	5	0.41	0.31	0.61	0.10
	Stillwater	3	10	0.43	0.16	0.69	0.09
	Stillwater	4	5	0.39	0.29	0.67	0.14
	Stillwater	5	5	0.35	0.14	0.72	0.22
	Albany/Troy	1	8	0.42	0.17	0.80	0.16

Notes:
Prep – fillet
% = percent
SE = Standard Error

Table 4-22
Percent Lipid Summary Statistics for Striped Bass

Pool	Station Number	Count	Average %	Minimum %	Maximum %	2 SE %
Albany/Troy	1	20	2.45	0.52	7.67	0.97
Catskill	1	20	2.19	0.29	4.75	0.61
Tappan Zee	1	17	3.44	0.71	8.39	1.12

Notes:
Prep – fillet
% = percent
SE = Standard Error

Table 4-23
Percent Lipid Summary Statistics for Pumpkinseed

Pool	Station Number	Count	Average %	Minimum %	Maximum %	2 SE %
Feeder Dam	1	20	2.96	0.97	3.76	0.31
Thompson Island Pool	1	5	1.57	0.84	2.11	0.41
Thompson Island Pool	2	5	1.87	0.94	3.61	0.96
Thompson Island Pool	3	5	1.92	1.38	2.38	0.32
Thompson Island Pool	4	5	1.58	0.80	2.63	0.80
Thompson Island Pool	5	10	1.92	0.85	3.38	0.56
Northumberland/Fort Miller	1	5	2.44	1.89	3.33	0.51
Northumberland/Fort Miller	2	5	3.33	2.52	3.83	0.45
Northumberland/Fort Miller	3	5	1.59	0.97	2.12	0.39
Northumberland/Fort Miller	5	10	2.47	1.74	3.18	0.34
Stillwater	1	5	2.31	1.67	2.94	0.46
Stillwater	2	5	2.25	1.61	2.76	0.44
Stillwater	3	5	2.23	1.70	2.94	0.47
Stillwater	4	5	2.66	2.23	3.02	0.28
Stillwater	5	10	2.14	1.34	2.60	0.29
Albany/Troy	1	11	3.26	1.58	5.18	0.68

Notes:
Prep – whole body
% = percent
SE = Standard Error

Table 4-24
Percent Lipid Summary Statistics for Forage Fish

Pool	Station Number	Count	Average %	Minimum %	Maximum %	2 SE %
Feeder Dam	1	10	3.73	0.78	5.25	0.98
Thompson Island Pool	1	2	0.43	0.18	0.67	0.49
Thompson Island Pool	2	2	1.80	0.22	3.38	3.17
Thompson Island Pool	3	2	1.59	1.15	2.02	0.87
Thompson Island Pool	4	2	2.06	0.19	3.94	3.75
Thompson Island Pool	5	2	1.04	0.35	1.74	1.39
Northumberland/Fort Miller	1	2	1.81	1.61	2.01	0.40
Northumberland/Fort Miller	2	2	5.43	4.88	5.99	1.11
Northumberland/Fort Miller	3	2	3.10	2.62	3.57	0.95
Northumberland/Fort Miller	5	4	2.30	1.79	2.68	0.38
Stillwater	1	2	4.61	4.18	5.04	0.86
Stillwater	2	2	3.58	2.08	5.08	3.00
Stillwater	3	2	3.65	3.46	3.83	0.37
Stillwater	4	2	4.20	4.10	4.30	0.20
Stillwater	5	2	3.65	2.01	5.29	3.28
Albany/Troy	1	6	4.54	2.34	8.78	1.91

Notes:
Prep – whole body (composite)
Forage fish = Golden Shiner, Spottail Shiner, Fallfish, Spotfin Shiner, and Mimic Shiner
% = percent
SE = Standard Error

Table 4-25
Sex Summary for Black Bass

Species	Pool	Total Count	Count of Males	Count of Females	Count of Unknowns
Largemouth Bass	Feeder Dam	3	2	1	0
	Thompson Island Pool	14	9	5	0
	Northumberland/Fort Miller	11	5	6	0
	Stillwater	17	13	4	0
	Catskill	4	1	3	0
Smallmouth Bass	Feeder Dam	17	10	7	0
	Thompson Island Pool	16	9	7	0
	Northumberland/Fort Miller	14	5	9	0
	Stillwater	13	6	7	0
	Albany/Troy	20	7	13	0
	Catskill	16	7	9	0

Table 4-26
Sex Summary for Ictalurids

Species	Pool	Total Count	Count of Males	Count of Females	Count of Unknowns
Brown Bullhead	Feeder Dam	20	13	7	0
	Thompson Island Pool	28	15	13	0
	Northumberland/Fort Miller	23	12	11	0
	Stillwater	29	14	15	0
	Catskill	20	11	9	0
Channel Catfish	Albany/Troy	20	5	15	0
Yellow Bullhead	Thompson Island Pool	2	0	0	2
	Northumberland/Fort Miller	2	0	0	2
	Stillwater	1	0	1	0

Table 4-27
Sex Summary for Perch

Species	Pool	Total Count	Count of Males	Count of Females	Count of Unknowns
White Perch	Albany/Troy	12	2	8	2
Yellow Perch	Feeder Dam	20	0	0	20
	Thompson Island Pool	30	4	0	26
	Northumberland/Fort Miller	25	6	0	19
	Stillwater	30	3	1	26
	Albany/Troy	8	1	0	7

Table 4-28
Sex Summary for Striped Bass

Species	Pool	Total Count	Count of Males	Count of Females	Count of Unknowns
Striped Bass	Albany/Troy	20	11	9	0
	Catskill	20	1	19	0
	Tappan Zee	17	6	11	0

Table 5-1

Summary of Analytical Data Quality for 2013 RAMP Aqueous Environmental Samples[1]

Analysis Fraction	Number of Results Qualified[2]										Total Number of Results[5]	Percent Completeness[6]	Percent Unusable Data[7]	Percent Usable Data[8]	Qualitative Data Quality
	Unqualified Positive Results	U	<J[3]	UB	JN	J	J[4]	UJ	R	UR					
Aroclor PCBs (NE273_02)	1,682	6,785	NA	0	0	1,113	730	44	0	0	9,624	95.2%	0.0%	100%	Excellent
mGBM PCBs (NE294_00/ NE294_00A and NE293_00)	2,727	5,388	9	855	0	1,619	1,412	4	0	0	10,602	88.4%	0.0%	100%	Very Good
Total metals (200.8 SLCH)	13	5	NA	1	0	5	3	0	0	0	24	85.7%	0.0%	100%	Very Good
Dissolved metals (200.8 SL)	1	6	NA	1	0	4	4	0	0	0	12	87.5%	0.0%	100%	Very Good
Hardness (SM 2340B)	5	0	NA	0	0	1	0	0	0	0	6	83%	0.0%	100%	Good
Total suspended solids (SM 2540D)	938	44	NA	1	0	266	0	21	0	0	1,270	77.3%	0.0%	100%	Good
Entire RAMP water sample dataset	5,366	12,228	9	858	0	3,008	2,149	69	0	0	21,538	90.8%	0.0%	100%	Very Good

Notes:

1. Summary is for water environmental samples and does not include results from field duplicates, field blanks, lab duplicates, matrix spikes, or blanks. Summary is based on qualification of data from verification and validation.

2. Results are the number of individual analytes in the analysis fraction. For example, there are eight analytes in the PCB Aroclor analysis fraction (by NE273_02).

3. Results for Total PCBs, where the sum of the positive PCB congener results was greater than 0 but below the sample-specific Total PCB method detection limit (MDL).

4. Results qualified as estimates due to being below the reporting limit. For example, of the 1113 NE273_02 PCB congener results that were qualified J, 730 results were qualified J due to being below the reporting limit.

5. Total number of results is the summation of all qualified and unqualified results.

6. The % completeness is the sum of results that were valid as reported [unqualified positive results + U]/total number of results - <J[3] - J[4].

7. The % unusable data is the sum of the results qualified R + UR/total number of results.

8. The % usable data is the sum of the unqualified positive results + U [+<J for total PCBs] + UB + J + JN + UJ/total number of results.

mGBM = Modified Green Bay Method

PCB = polychlorinated biphenyl

RAMP = Remedial Action Monitoring Program

Table 5-2
Summary of Analytical Data Quality for 2013 RAMP Fish Tissue Environmental Samples[1]

Analysis Fraction	Number of Results Qualified[2]										Total Number of Results[5]	Percent Completeness[6]	Percent Unusable Data[7]	Percent Usable Data[8]	Qualitative Data Quality
	Unqualified Positive Results	U	<J[3]	U*	JN	J	J[4]	UJ	R	UR					
PCBs as Aroclors (NE148_08[9])	2,276	2,586	0	0	0	210	177	0	0	0	5,072	99.3%	0.0%	100%	Excellent
PCB Congeners (NE013_10)	1,692	843	1	122	0	1,224	1,125	38	0	0	3,920	90.7%	0.0%	100%	Very Good
Lipids (NE158_05[10])	624	0	0	0	0	8	0	0	0	0	632	98.7%	0.0%	100%	Excellent
Entire fish tissue dataset	4,592	3,429	1	122	0	1,442	1,302	38	0	0	9,624	96.4%	0.0%	100%	Excellent

Notes:

1. Summary is for fish tissue environmental samples and does not include results from lab duplicates, matrix spikes or blanks. Summary is based on qualification of data from verification and validation.

2. Results are the number of individual analytes in the analysis fraction. For example, there are eight analytes in the Total PCBs as Aroclors analysis fraction.

3. Results for Total PCBs where the sum of the positive PCB congener results was greater than 0 but below the sample-specific Total PCB method detection limit (MDL).

4. Results qualified as estimates due to being below the reporting limit. For example, of the 210 NE148_08 results that were qualified J, 177 results were qualified J due to being below the reporting limit.

5. Total number of results is the summation of all qualified and unqualified results.

6. The % completeness is the sum of results that were valid as reported [Unqualified Positive Results + U]/Total Number of Results - <J[3] - J[4].

7. The % unusable data is the sum of the results qualified R + UR/total number of results.

8. The % usable data is the sum of the unqualified positive results + U [+<J for total PCBs] + U* + J + JN + UJ/total number of results.

9. The analytical method "NE148_04," as designated in the database, indicates a sample analyzed by NE148_08. The designation "NE148_04" was used in the database due to a valid value limitation.

10. The analytical method "NE158_03," as designated in the database, indicates a sample analyzed by NE158_05. The designation "NE158_03" was used in the database due to a valid value limitation.

PCB = polychlorinated biphenyl

RAMP = Remedial Action Monitoring Program

Table 5-3

Summary of Analytical Data Quality for 2013 RAMP Downstream Deposition Study Sediment Environmental Samples[1]

Analysis Fraction	Number of Results Qualified[2]										Total Number of Results[5]	Percent Completeness[6]	Percent Unusable Data[7]	Percent Usable Data[8]	Qualitative Data Quality
	Unqualified Positive Results	U	<J[3]	U*	JN	J	J[4]	UJ	R	UR					
PCBs as Aroclors (GEHR8082)	169	279	0	0	0	85	18	59	0	0	592	78.0%	0.0%	100%	Good
Total organic carbon (Lloyd Kahn)	38	0	0	0	0	36	0	0	0	0	74	51.4%	0.0%	100%	Average
Entire DDS sediment dataset	207	279	0	0	0	121	18	59	0	0	666	75.0%	0.0%	100%	Good

Notes:

1. Summary is for downstream deposition study sediment environmental samples and does not include results from blanks or performance evaluation samples. Summary is based on qualification of data from verification and validation.

2. Results are the number of individual analytes in the analysis fraction. For example, there are eight analytes in the Total PCBs as Aroclors analysis fraction.

3. Results for Total PCBs where the sum of the positive PCB congener results was greater than 0 but below the sample-specific Total PCB method detection limit (MDL).

4. Results qualified as estimates due to being below the reporting limit. For example, of the 85 GEHR8082 results that were qualified J, 18 results were qualified J due to being below the reporting limit.

5. Total number of results is the summation of all qualified and unqualified results.

6. The % completeness is the sum of results that were valid as reported [Unqualified Positive Results + U]/Total Number of Results - $<J^3$ - J^4.

7. The % unusable data is the sum of the results qualified R + UR/total number of results.

8. The % usable data is the sum of the unqualified positive results + U [+<J for total PCBs] + U* + J + JN + UJ/total number of results.

DDS = Downstream Deposition Study

PCB = polychlorinated biphenyl

RAMP = Remedial Action Monitoring Program

Table 5-4
Summary of RAMP Water Field Duplicate Results for the Modified Green Bay Method in 2013

Method	Matrix	Analyte	Total Number Field Duplicate Pairs	Total Number Field Duplicate Pairs with NDs for Both Samples	Total Number Field Duplicate Pairs with Positives in Either Sample					Overall Percent Meet Criteria
					Total Number	Number Meet Criteria	Number Do Not Meet Criteria	Percent Meet Criteria	Percent Do Not Meet Criteria	
NE294_00	Water	Total PCB	41	0	41	41	0	100	0	100
NE294_00	Water	Peak 2	41	0	41	40	1	98	2	98
NE294_00	Water	Peak 3	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 4	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 5-4	41	0	41	39	2	95	5	95
NE294_00	Water	Peak 5-10	41	0	41	41	0	100	0	100
NE294_00	Water	Peak 6	41	7	34	29	5	85	15	88
NE294_00	Water	Peak 7	41	23	18	17	1	94	6	98
NE294_00	Water	Peak 8	41	0	41	40	1	98	2	98
NE294_00	Water	Peak 9	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 10	41	3	38	37	1	97	3	98
NE294_00	Water	Peak 11	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 12	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 13	41	0	41	24	17	59	41	59
NE294_00	Water	Peak 14	41	2	39	38	1	97	3	98
NE294_00	Water	Peak 15	41	1	40	39	1	98	3	98
NE294_00	Water	Peak 16	41	1	40	38	2	95	5	95
NE294_00	Water	Peak 17	41	0	41	40	1	98	2	98
NE294_00	Water	Peak 19	41	1	40	40	0	100	0	100
NE294_00	Water	Peak 20	41	33	8	3	5	38	63	88
NE294_00	Water	Peak 21	41	0	41	40	1	98	2	98
NE294_00	Water	Peak 22	41	7	34	27	7	79	21	83
NE294_00	Water	Peak 23	41	1	40	39	1	98	3	98
NE294_00	Water	Peak 24	41	4	37	37	0	100	0	100
NE294_00	Water	Peak 25	41	1	40	39	1	98	3	98
NE294_00	Water	Peak 26	41	2	39	38	1	97	3	98
NE294_00	Water	Peak 27	41	7	34	28	6	82	18	85
NE294_00	Water	Peak 28	41	41	0	0	0	NA	NA	100

Table 5-4

Summary of RAMP Water Field Duplicate Results for the Modified Green Bay Method in 2013

Method	Matrix	Analyte	Total Number Field Duplicate Pairs	Total Number Field Duplicate Pairs with NDs for Both Samples	Total Number Field Duplicate Pairs with Positives in Either Sample					Overall Percent Meet Criteria
					Total Number	Number Meet Criteria	Number Do Not Meet Criteria	Percent Meet Criteria	Percent Do Not Meet Criteria	
NE294_00	Water	Peak 29	41	33	8	1	7	13	88	83
NE294_00	Water	Peak 30	41	40	1	1	0	NA	NA	100
NE294_00	Water	Peak 31	41	1	40	39	1	98	3	98
NE294_00	Water	Peak 32	41	1	40	38	2	95	5	95
NE294_00	Water	Peak 33	41	29	12	10	2	83	17	95
NE294_00	Water	Peak 34	41	33	8	6	2	75	25	95
NE294_00	Water	Peak 35	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 36	41	24	17	17	0	100	0	100
NE294_00	Water	Peak 37	41	0	41	41	0	100	0	100
NE294_00	Water	Peak 38	41	6	35	34	1	97	3	98
NE294_00	Water	Peak 39	41	0	41	41	0	100	0	100
NE294_00	Water	Peak 41	41	2	39	39	0	100	0	100
NE294_00	Water	Peak 42	41	7	34	32	2	94	6	95
NE294_00	Water	Peak 43	41	7	34	34	0	100	0	100
NE294_00	Water	Peak 44	41	26	15	9	6	60	40	85
NE294_00	Water	Peak 45	41	23	18	9	9	50	50	78
NE294_00	Water	Peak 46	41	3	38	38	0	100	0	100
NE294_00	Water	Peak 47	41	23	18	18	0	100	0	100
NE294_00	Water	Peak 48	41	4	37	37	0	100	0	100
NE294_00	Water	Peak 49	41	14	27	23	4	85	15	90
NE294_00	Water	Peak 50	41	14	27	25	2	93	7	95
NE294_00	Water	Peak 51	41	6	35	31	4	89	11	90
NE294_00	Water	Peak 52	41	17	24	11	13	46	54	68
NE294_00	Water	Peak 53	41	3	38	38	0	100	0	100
NE294_00	Water	Peak 54	41	1	40	40	0	100	0	100
NE294_00	Water	Peak 55	41	18	23	10	13	43	57	68
NE294_00	Water	Peak 56	41	4	37	26	11	70	30	73
NE294_00	Water	Peak 57	41	28	13	11	2	85	15	95

Table 5-4
Summary of RAMP Water Field Duplicate Results for the Modified Green Bay Method in 2013

Method	Matrix	Analyte	Total Number Field Duplicate Pairs	Total Number Field Duplicate Pairs with NDs for Both Samples	Total Number Field Duplicate Pairs with Positives in Either Sample					Overall Percent Meet Criteria
					Total Number	Number Meet Criteria	Number Do Not Meet Criteria	Percent Meet Criteria	Percent Do Not Meet Criteria	
NE294_00	Water	Peak 58	41	6	35	33	2	94	6	95
NE294_00	Water	Peak 59	41	0	41	41	0	100	0	100
NE294_00	Water	Peak 60	41	2	39	31	8	79	21	80
NE294_00	Water	Peak 61	41	1	40	39	1	98	3	98
NE294_00	Water	Peak 62	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 63	41	18	23	22	1	96	4	98
NE294_00	Water	Peak 64	41	1	40	40	0	100	0	100
NE294_00	Water	Peak 65	41	7	34	31	3	91	9	93
NE294_00	Water	Peak 66	41	36	5	4	1	80	20	98
NE294_00	Water	Peak 67	41	36	5	4	1	80	20	98
NE294_00	Water	Peak 68	41	38	3	3	0	100	0	100
NE294_00	Water	Peak 69	41	9	32	32	0	100	0	100
NE294_00	Water	Peak 70	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 71	41	27	14	8	6	NA	NA	85
NE294_00	Water	Peak 72	41	31	10	5	5	NA	NA	88
NE294_00	Water	Peak 73	41	27	14	12	2	NA	NA	95
NE294_00	Water	Peak 74	41	2	39	39	0	100	0	100
NE294_00	Water	Peak 75	41	28	13	13	0	NA	NA	100
NE294_00	Water	Peak 76	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 77	41	36	5	5	0	NA	NA	100
NE294_00	Water	Peak 78	41	35	6	6	0	NA	NA	100
NE294_00	Water	Peak 79	41	35	6	1	5	NA	NA	88
NE294_00	Water	Peak 80	41	36	5	5	0	NA	NA	100
NE294_00	Water	Peak 82	41	2	39	39	0	100	0	100
NE294_00	Water	Peak 83	41	33	8	6	2	NA	NA	95
NE294_00	Water	Peak 84	41	35	6	1	5	NA	NA	88
NE294_00	Water	Peak 85	41	33	8	8	0	NA	NA	100
NE294_00	Water	Peak 87	41	38	3	3	0	NA	NA	100

Table 5-4
Summary of RAMP Water Field Duplicate Results for the Modified Green Bay Method in 2013

Method	Matrix	Analyte	Total Number Field Duplicate Pairs	Total Number Field Duplicate Pairs with NDs for Both Samples	Total Number Field Duplicate Pairs with Positives in Either Sample					Overall Percent Meet Criteria
					Total Number	Number Meet Criteria	Number Do Not Meet Criteria	Percent Meet Criteria	Percent Do Not Meet Criteria	
NE294_00	Water	Peak 88	41	40	1	1	0	NA	NA	100
NE294_00	Water	Peak 89	41	35	6	5	1	NA	NA	98
NE294_00	Water	Peak 90	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 91	41	38	3	1	2	NA	NA	95
NE294_00	Water	Peak 92	41	38	3	3	0	NA	NA	100
NE294_00	Water	Peak 93	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 94	41	37	4	4	0	NA	NA	100
NE294_00	Water	Peak 95	41	37	4	4	0	NA	NA	100
NE294_00	Water	Peak 96	41	37	4	4	0	NA	NA	100
NE294_00	Water	Peak 98	41	39	2	1	1	NA	NA	98
NE294_00	Water	Peak 99	41	39	2	2	0	NA	NA	100
NE294_00	Water	Peak 100	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 101	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 102	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 103	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 104	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 105	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 106	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 107	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 108	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 109	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 110	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 111	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 112	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 113	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 114	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 115	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 116	41	41	0	0	0	NA	NA	100

Table 5-4

Summary of RAMP Water Field Duplicate Results for the Modified Green Bay Method in 2013

Method	Matrix	Analyte	Total Number Field Duplicate Pairs	Total Number Field Duplicate Pairs with NDs for Both Samples	Total Number Field Duplicate Pairs with Positives in Either Sample					Overall Percent Meet Criteria
					Total Number	Number Meet Criteria	Number Do Not Meet Criteria	Percent Meet Criteria	Percent Do Not Meet Criteria	
NE294_00	Water	Peak 117	41	41	0	0	0	NA	NA	100
NE294_00	Water	Peak 118	41	41	0	0	0	NA	NA	100
NE294_00	Water	All results[1]	4674	2623	2051	1869	182	91	9	96

Notes:

1 . All results = total number field duplicate pairs multiplied by the number of analytes determined by the method.

ND = not detected

PCB = polychlorinated biphenyl

RAMP = Remedial Action Monitoring Program

Table 5-5
Summary of RAMP Water Field Duplicate Results for Aroclor PCBs in 2013

Method	Analyte	Total Number Field Duplicate Pairs	Total Number Field Duplicate Pairs with NDs for Both Samples	Total Number Field Duplicate Pairs with Positives in Either Sample					Overall Percent Meet Criteria
				Total Number	Number Meet Criteria	Do Not Meet Criteria	Percent Meet Criteria	Percent Do Not Meet Criteria	
NE273_02	Total PCB	103	9	94	89	5	95	5	95
NE273_02	Aroclor 1016	103	103	0	0	0	NA	NA	100
NE273_02	Aroclor 1221	103	9	94	93	1	99	1	99
NE273_02	Aroclor 1232	103	103	0	0	0	NA	NA	100
NE273_02	Aroclor 1242	103	43	60	59	1	98	2	99
NE273_02	Aroclor 1248	103	103	0	0	0	NA	NA	100
NE273_02	Aroclor 1254	103	98	5	5	0	100	0	100
NE273_02	Aroclor 1260	103	103	0	0	0	NA	NA	100
NE273_02	All results	824	571	253	246	7	97	3	99

Notes:

All results = total number field duplicate pairs multiplied by the number of analytes determined by the method.

ND = not detected

PCB = polychlorinated biphenyl

RAMP = Remedial Action Monitoring Program

Table 5-6

Summary of Water Field Duplicate Results for all Non-PCB Methods in 2013

Method	Analyte	Total Number Field Duplicate Pairs	Total Number Field Duplicate Pairs with NDs for Both Samples	Total Number Field Duplicate Pairs with Positives in Either Sample					Overall Percent Meet Criteria
				Total Number	Number Meet Criteria	Number Do Not Meet Criteria	Percent Meet Criteria	Percent Do Not Meet Criteria	
EPA 200.8 SL	Dissolved Cadmium	1	1	0	0	0	NA	NA	100
EPA 200.8 SL	Dissolved Lead	1	0	1	1	0	100	0	100
EPA 200.8 SLCH	Total Cadmium	1	1	0	0	0	NA	NA	100
EPA 200.8 SLCH	Total Calcium	1	0	1	0	1	0	100	0
EPA 200.8 SLCH	Total Lead	1	0	1	1	0	100	0	100
EPA 200.8 SLCH	Total Magnesium	1	0	1	0	1	0	100	0
SM 2340B	Hardness	1	0	1	0	1	0	100	0
SM 2540D	Total Suspended Solids	141	3	138	108	30	78	22	79

Notes:

All results = total number field duplicate pairs multiplied by the number of analytes determined by the method.

ND = not detected

PCB = polychlorinated biphenyl

Table 5-7

Summary of RAMP Downstream Deposition Study Sediment Field Duplicate Results for Aroclor PCBs in 2013

Method	Analyte	Total Number Field Duplicate Pairs	Total Number Field Duplicate Pairs with NDs for Both Samples	Total Number Field Duplicate Pairs with Positives in Either Sample					Overall Percent Meet Criteria
				Total Number	Number Meet Criteria	Number Do Not Meet Criteria	Percent Meet Criteria	Percent Do Not Meet Criteria	
GEHR8082	Total PCB	6	0	6	6	0	100	0	100
GEHR8082	Aroclor 1016	6	6	0	0	0	NA	NA	100
GEHR8082	Aroclor 1221	6	0	6	4	2	67	33	67
GEHR8082	Aroclor 1232	6	6	0	0	0	NA	NA	100
GEHR8082	Aroclor 1242	6	0	6	5	1	83	17	83
GEHR8082	Aroclor 1248	6	6	0	0	0	NA	NA	100
GEHR8082	Aroclor 1254	6	3	3	2	1	67	33	83
GEHR8082	Aroclor 1260	6	6	0	0	0	NA	NA	100
GEHR8082	All results	48	27	21	17	4	81	19	92

Notes:

All results = total number field duplicate pairs multiplied by the number of analytes determined by the method.

ND = not detected

PCB = polychlorinated biphenyl

RAMP = Remedial Action Monitoring Program

Table 5-8

Summary of Downstream Deposition Study Sediment Field Duplicate Results for all Non-PCB Methods in 2013

Method	Analyte	Total Number Field Duplicate Pairs	Total Number Field Duplicate Pairs with NDs for Both Samples	Total Number Field Duplicate Pairs with Positives in Either Sample					Overall Percent Meet Criteria
				Total Number	Number Meet Criteria	Number Do Not Meet Criteria	Percent Meet Criteria	Percent Do Not Meet Criteria	
SM 5310B	Total organic carbon	6	0	6	6	0	100	0	100
ASTM D2216-98	Moisture content	6	0	6	6	0	100	0	100

Notes:

All results = total number field duplicate pairs multiplied by the number of analytes determined by the method.

ND = not detected

PCB = polychlorinated biphenyl

Table 5-9
Summary Statistics of 2013 RAMP Equipment Blanks for Water Sampling Program

Analyte	Matrix	Method	Number Field Blanks	Field Blanks with Results > MDL	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Concentration Units	Percent Contaminated
Dissolved lead	Filtered water	EPA 200.8 SL	5	3	0.068	0.15	0.10	0.082	µg/L	60%
Total PCBs	Whole water	NE294_00	11	1	2.08	2.08	2.08	2.08	ng/L	9%
mGBM Peak 2	Whole water	NE294_00	11	3	0.120	0.549	0.281	0.174	ng/L	27%
mGBM Peak 5-4	Whole water	NE294_00	11	5	0.0162	0.191	0.0731	0.0570	ng/L	45%
mGBM Peak 5-10	Whole water	NE294_00	11	1	0.0514	0.0514	0.0514	0.0514	ng/L	9%
mGBM Peak 6	Whole water	NE294_00	11	4	0.00853	0.0750	0.0422	0.0426	ng/L	36%
mGBM Peak 7	Whole water	NE294_00	11	10	0.0336	1.64	0.282	0.0882	ng/L	91%
mGBM Peak 8	Whole water	NE294_00	11	1	0.214	0.214	0.214	0.214	ng/L	9%
mGBM Peak 10	Whole water	NE294_00	11	10	0.0147	0.377	0.0802	0.0392	ng/L	91%
mGBM Peak 13	Whole water	NE294_00	11	4	0.0105	0.233	0.0693	0.0168	ng/L	36%
mGBM Peak 14	Whole water	NE294_00	11	1	0.0447	0.0447	0.0447	0.0447	ng/L	9%
mGBM Peak 15	Whole water	NE294_00	11	2	0.131	0.253	0.192	0.192	ng/L	18%
mGBM Peak 16	Whole water	NE294_00	11	4	0.00260	0.0438	0.0143	0.00539	ng/L	36%
mGBM Peak 17	Whole water	NE294_00	11	2	0.101	0.380	0.241	0.241	ng/L	18%
mGBM Peak 19	Whole water	NE294_00	11	1	0.191	0.191	0.191	0.191	ng/L	9%
mGBM Peak 20	Whole water	NE294_00	11	3	0.00255	0.0214	0.0120	0.0121	ng/L	27%
mGBM Peak 21	Whole water	NE294_00	11	10	0.00544	0.0717	0.0260	0.0208	ng/L	91%
mGBM Peak 22	Whole water	NE294_00	11	10	0.0142	0.0783	0.0344	0.0225	ng/L	91%
mGBM Peak 23	Whole water	NE294_00	11	1	0.0769	0.0769	0.0769	0.0769	ng/L	9%
mGBM Peak 25	Whole water	NE294_00	11	1	0.0229	0.0229	0.0229	0.0229	ng/L	9%
mGBM Peak 26	Whole water	NE294_00	11	4	0.0144	0.305	0.0989	0.0382	ng/L	36%
mGBM Peak 27	Whole water	NE294_00	11	11	0.00616	0.173	0.0466	0.0304	ng/L	100%
mGBM Peak 29	Whole water	NE294_00	11	11	0.0101	0.221	0.0454	0.0234	ng/L	100%
mGBM Peak 33	Whole water	NE294_00	11	9	0.0403	0.694	0.173	0.102	ng/L	82%
mGBM Peak 34	Whole water	NE294_00	11	8	0.0184	0.119	0.043	0.0293	ng/L	73%
mGBM Peak 36	Whole water	NE294_00	11	1	0.123	0.123	0.123	0.123	ng/L	9%
mGBM Peak 37	Whole water	NE294_00	11	1	0.394	0.394	0.394	0.394	ng/L	9%
mGBM Peak 38	Whole water	NE294_00	11	4	0.0204	0.181	0.0704	0.0400	ng/L	36%
mGBM Peak 42	Whole water	NE294_00	11	2	0.00626	0.172	0.0891	0.0891	ng/L	18%

Table 5-9

Summary Statistics of 2013 RAMP Equipment Blanks for Water Sampling Program

Analyte	Matrix	Method	Number Field Blanks	Field Blanks with Results > MDL	Minimum Concentration	Maximum Concentration	Average Concentration	Median Concentration	Concentration Units	Percent Contaminated
mGBM Peak 44	Whole water	NE294_00	11	4	0.0153	0.0912	0.0371	0.0209	ng/L	36%
mGBM Peak 45	Whole water	NE294_00	11	6	0.00330	0.328	0.0667	0.0162	ng/L	55%
mGBM Peak 46	Whole water	NE294_00	11	3	0.0129	0.0162	0.0143	0.0139	ng/L	27%
mGBM Peak 49	Whole water	NE294_00	11	7	0.00758	0.186	0.0613	0.0193	ng/L	64%
mGBM Peak 51	Whole water	NE294_00	11	10	0.0107	0.949	0.157	0.0281	ng/L	91%
mGBM Peak 52	Whole water	NE294_00	11	3	0.00194	0.0223	0.0151	0.0211	ng/L	27%
mGBM Peak 54	Whole water	NE294_00	11	3	0.00357	0.0344	0.0139	0.00364	ng/L	27%
mGBM Peak 55	Whole water	NE294_00	11	7	0.00133	0.0301	0.00759	0.00424	ng/L	64%
mGBM Peak 56	Whole water	NE294_00	11	5	0.0071	0.0483	0.0167	0.0089	ng/L	45%
mGBM Peak 57	Whole water	NE294_00	11	8	0.0143	0.219	0.0738	0.0495	ng/L	73%
mGBM Peak 58	Whole water	NE294_00	11	5	0.00701	0.143	0.0399	0.0167	ng/L	45%
mGBM Peak 59	Whole water	NE294_00	11	1	0.0140	0.0140	0.0140	0.0140	ng/L	9%
mGBM Peak 63	Whole water	NE294_00	11	4	0.00212	0.0689	0.0260	0.0164	ng/L	36%
mGBM Peak 64	Whole water	NE294_00	11	1	0.0113	0.0113	0.0113	0.0113	ng/L	9%
mGBM Peak 65	Whole water	NE294_00	11	4	0.00302	0.00756	0.00425	0.00321	ng/L	36%
mGBM Peak 66	Whole water	NE294_00	11	3	0.00693	0.190	0.0815	0.0475	ng/L	27%
mGBM Peak 67	Whole water	NE294_00	11	8	0.00434	0.0737	0.0160	0.00665	ng/L	73%
mGBM Peak 68	Whole water	NE294_00	11	3	0.0465	0.298	0.134	0.0588	ng/L	18%
mGBM Peak 74	Whole water	NE294_00	11	1	0.0124	0.0124	0.0124	0.0124	ng/L	9%

Notes:

µg/L = micrograms per liter

ng/L = nanograms per liter

MDL = method detection limit

mGBM = Modified Green Bay Method

RAMP = Remedial Action Monitoring Program

FIGURES

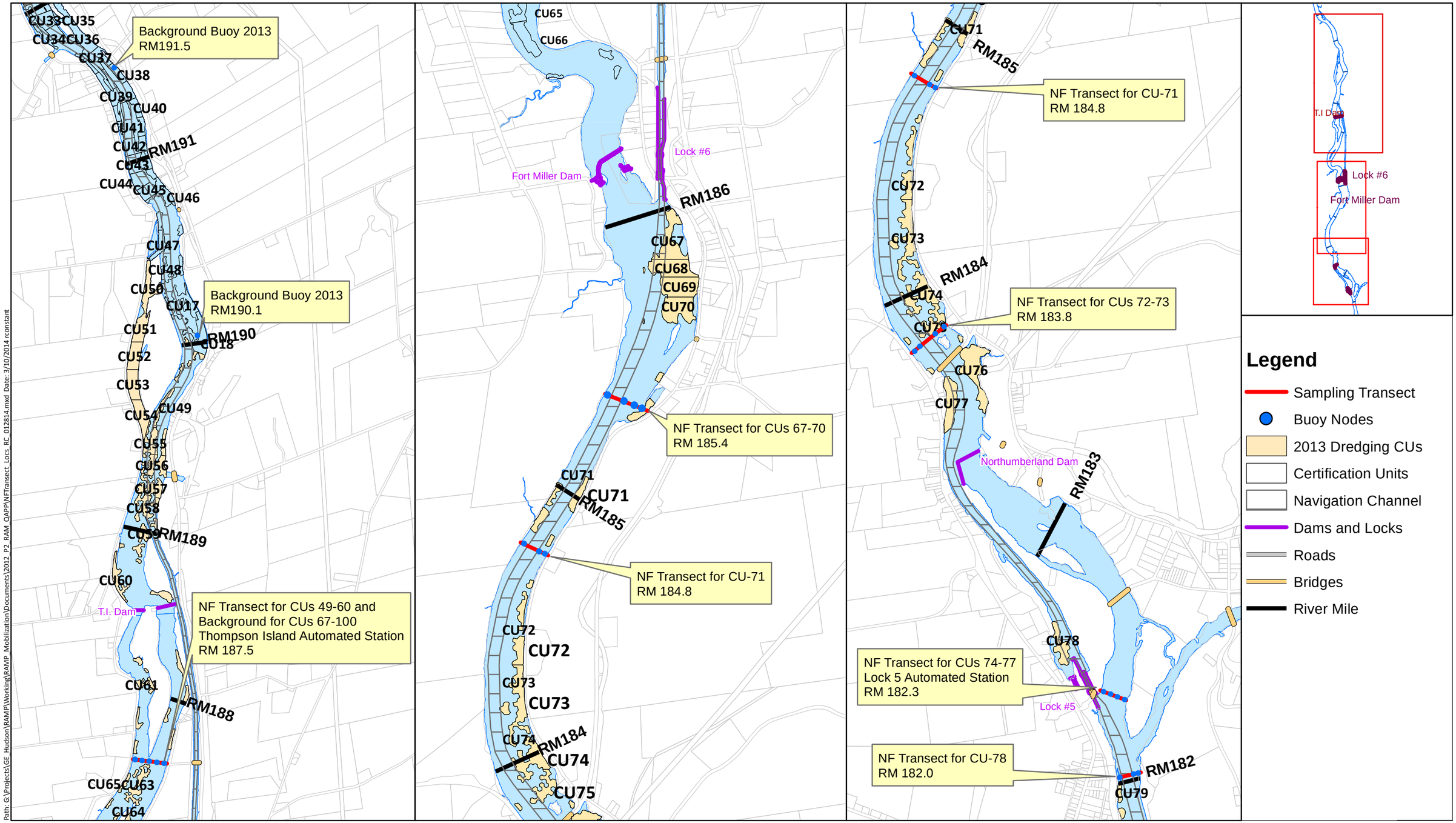

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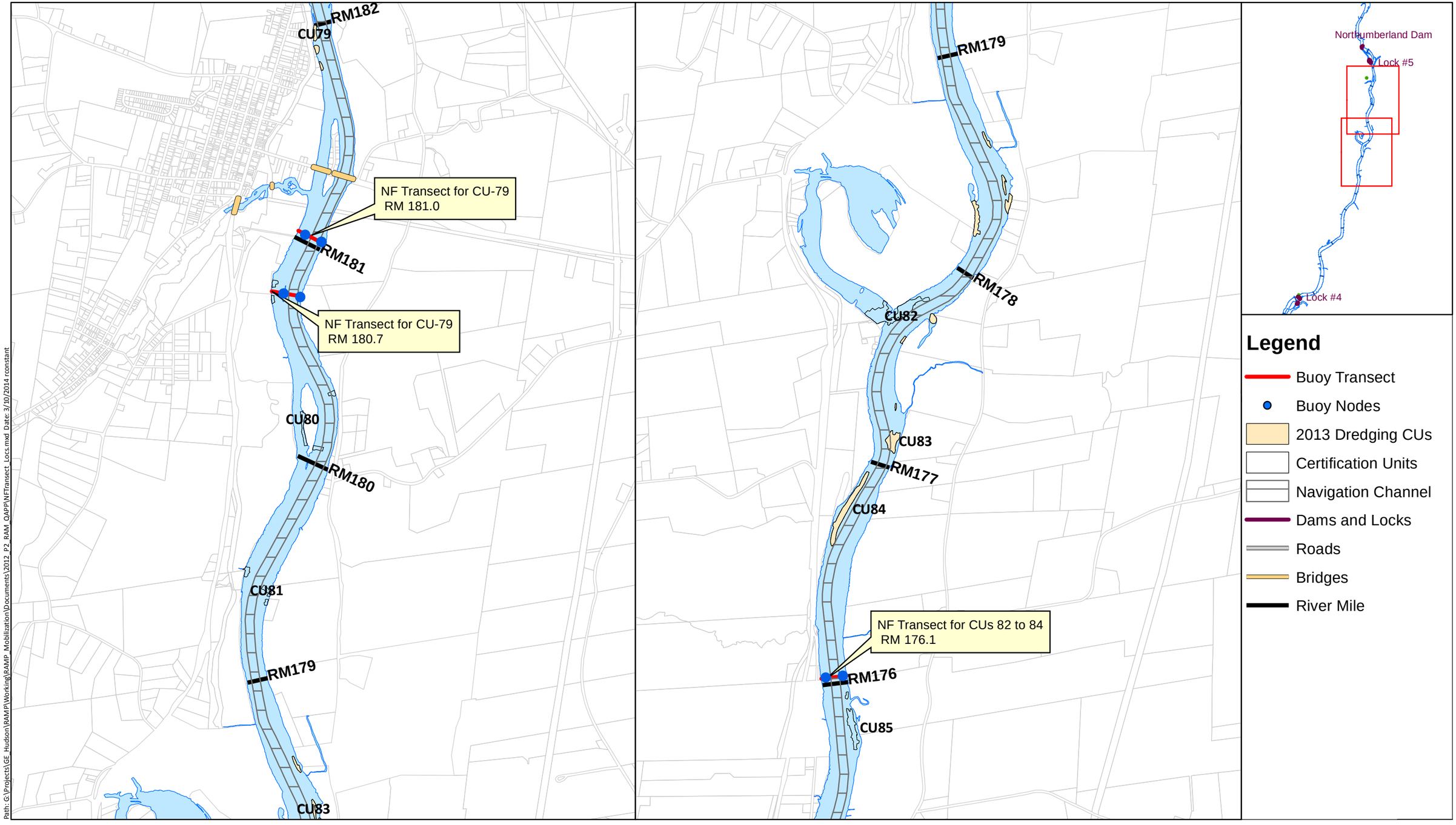
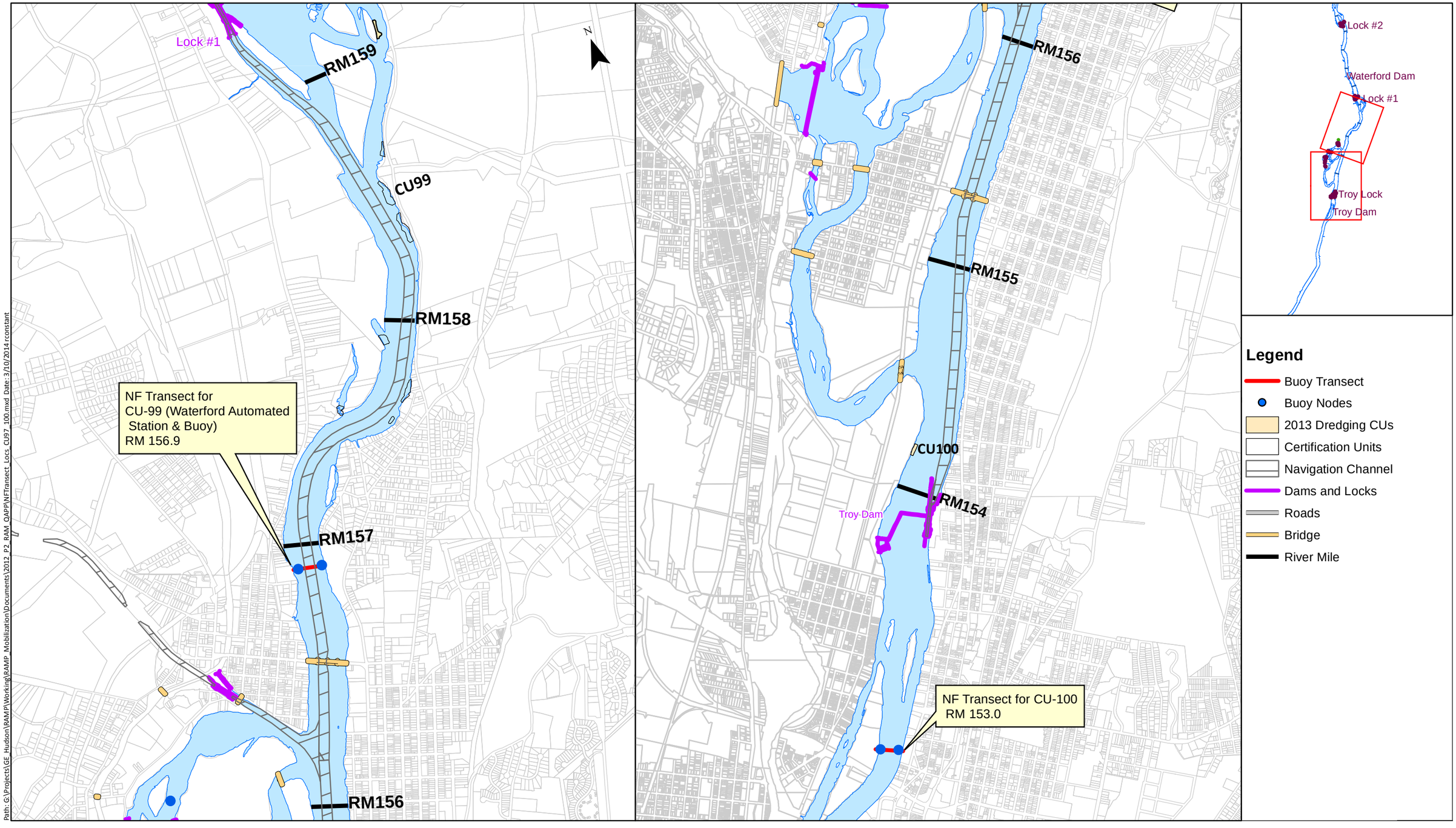
Figure 2-1a
Near-field Transect Locations
2013 Data Summary Report
Prepared for the General Electric Company



ANCHOR QEA

Figure 2-1b
Near-field Transect Locations
2013 Data Summary Report
Prepared for the General Electric Company



ANCHOR QEA

Figure 2-1c
Near-field Transect Locations
2013 Data Summary Report
Prepared for the General Electric Company

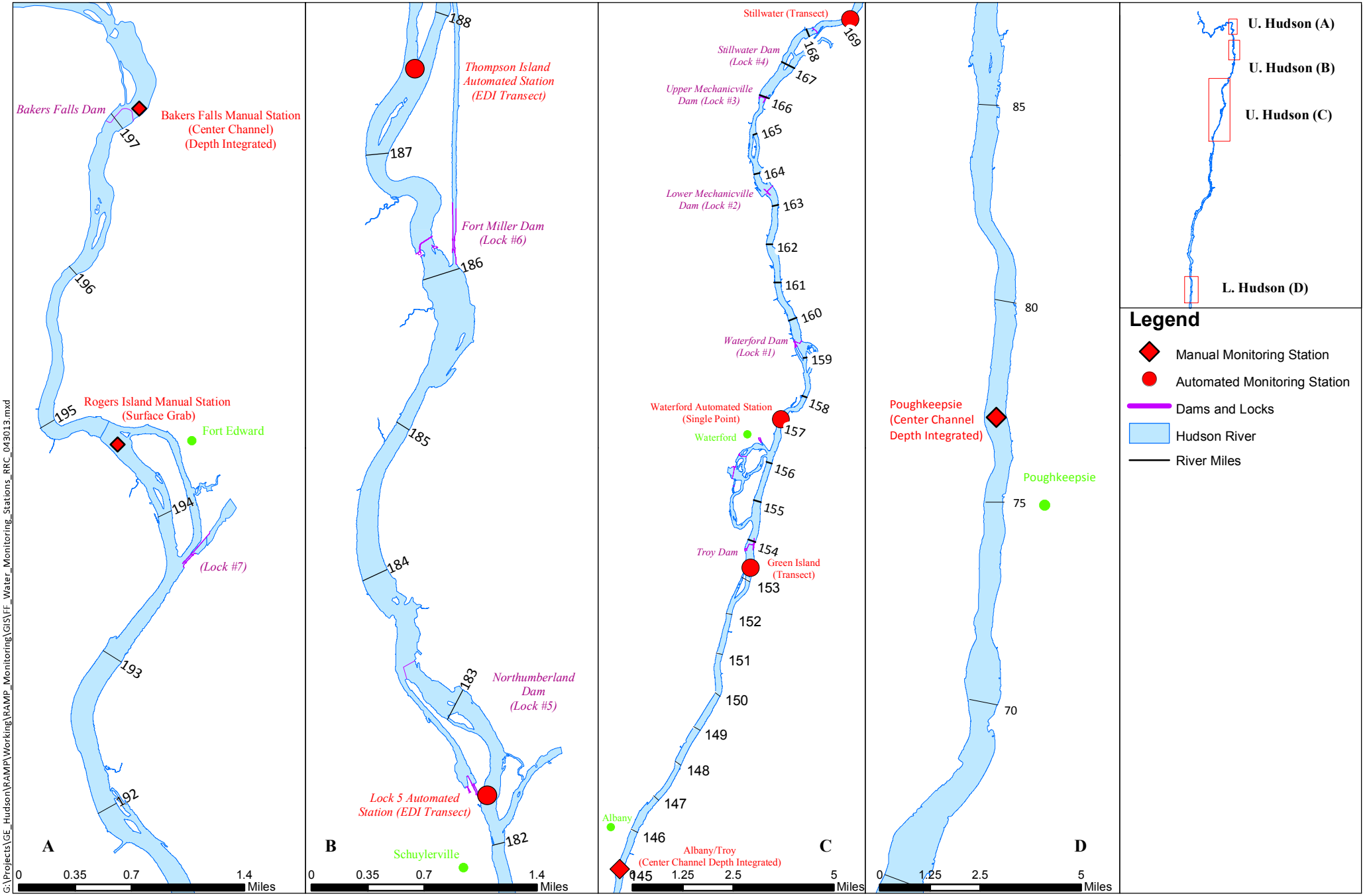


Figure 2-2
Far-Field Water Monitoring Stations
2013 Data Summary Report
Prepared for the General Electric Company

Figure 2-3
Variable Speed Bridge and Boat Cranes Used for the Far-field Water Monitoring Program
2013 Data Summary Report
Prepared for the General Electric Company

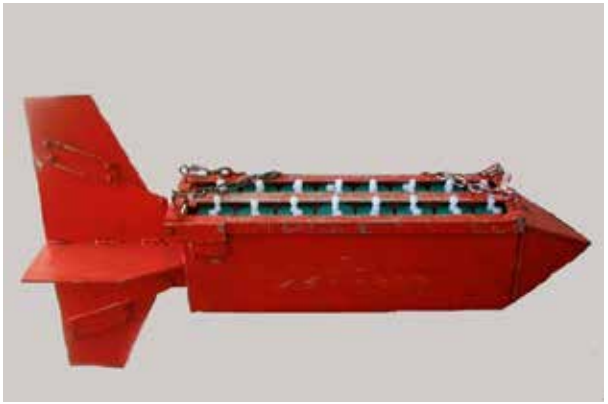
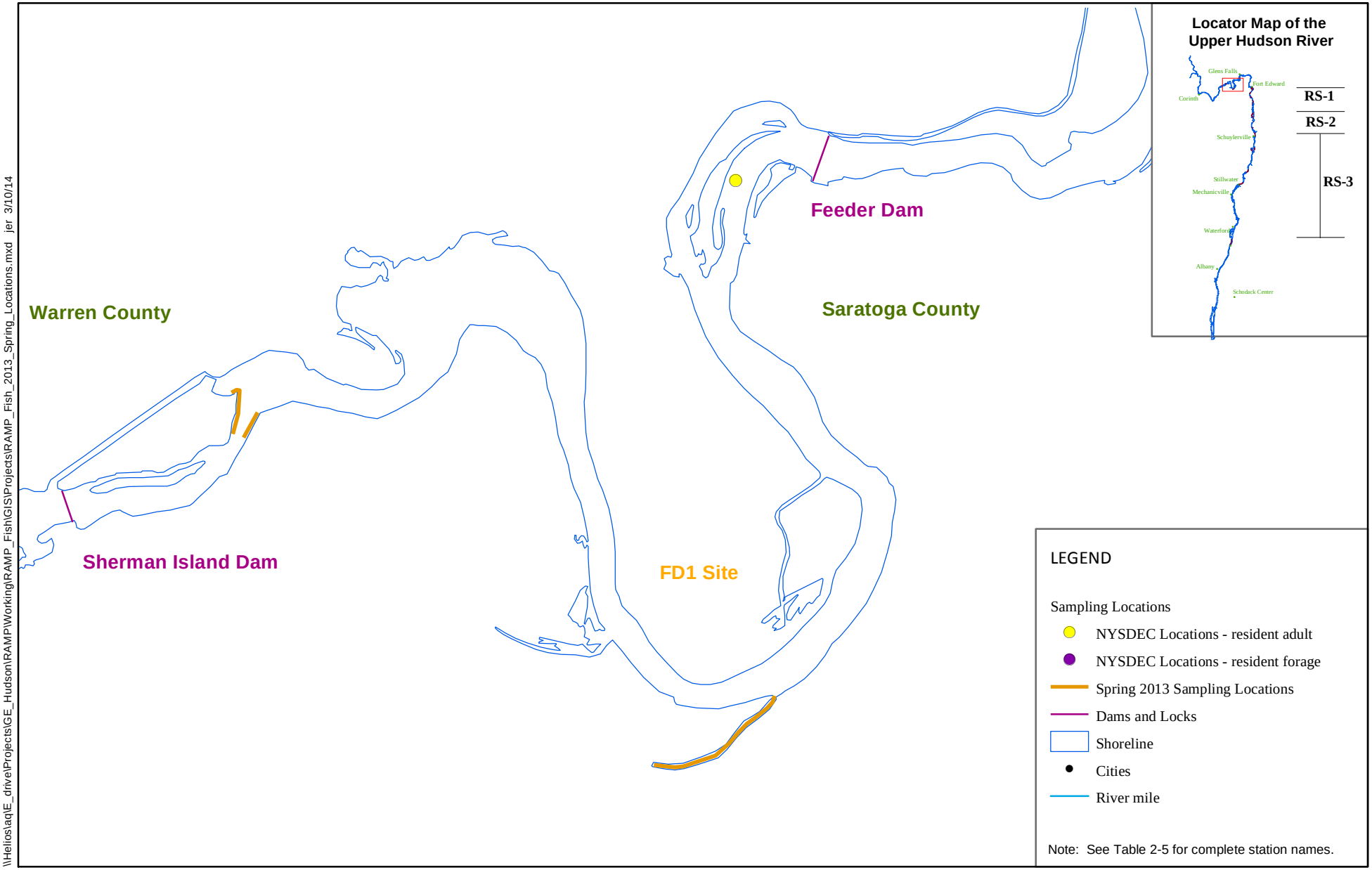


Figure 2-4
Multiple Aliquot Depth-integrated Sampler (MADIS)
2013 Data Summary Report
Prepared for the General Electric Company



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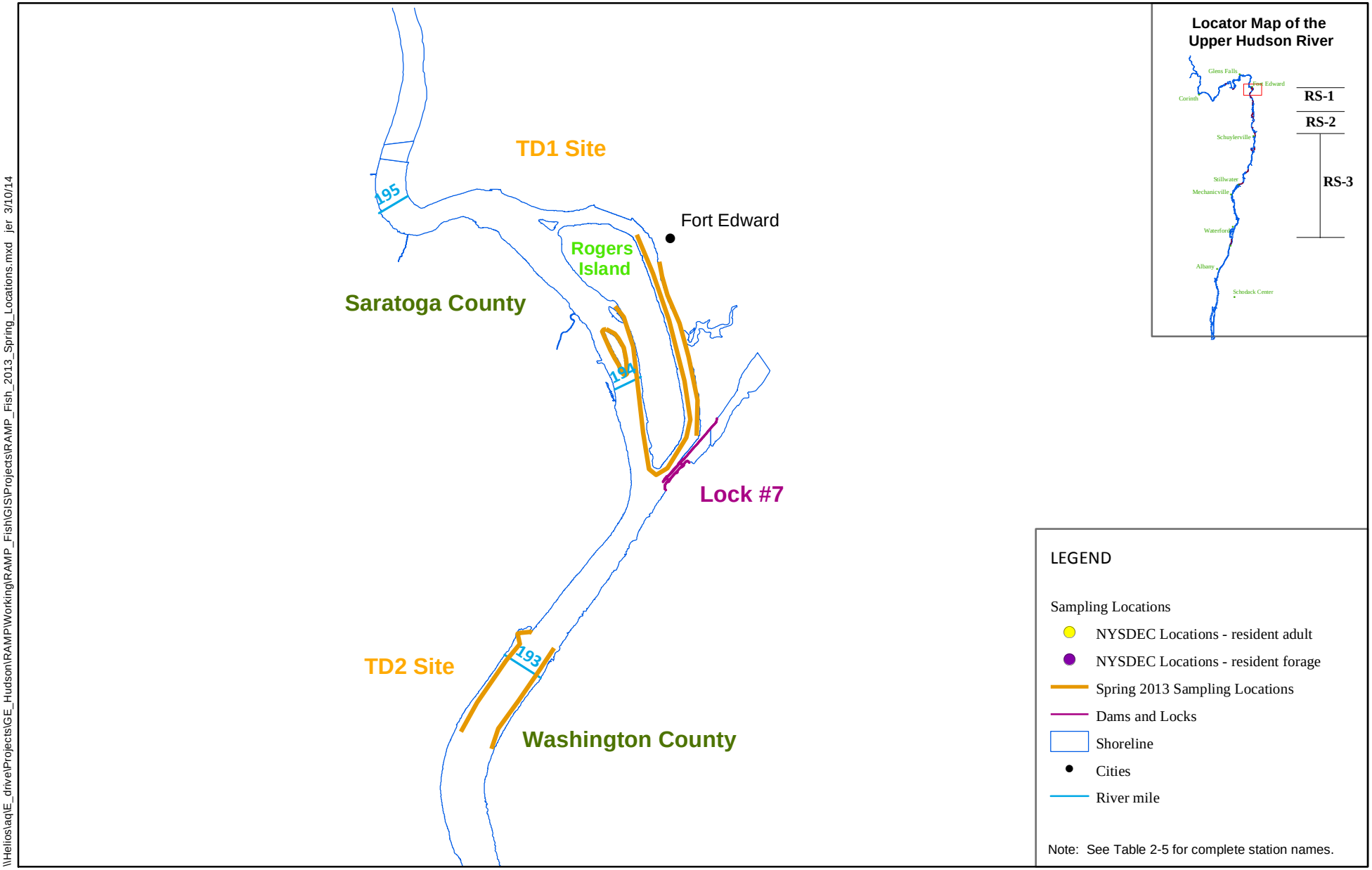
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5a

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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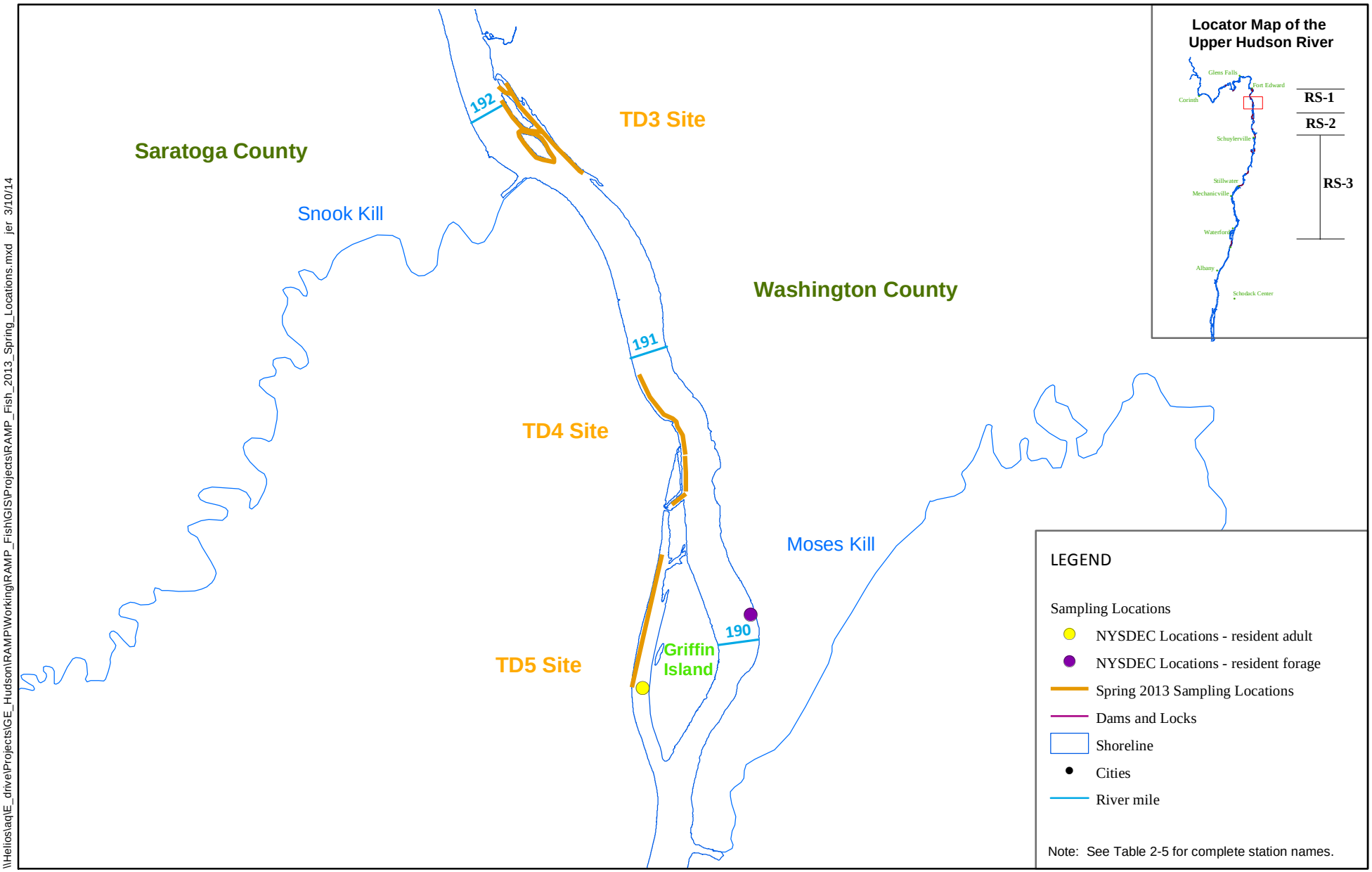
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5b

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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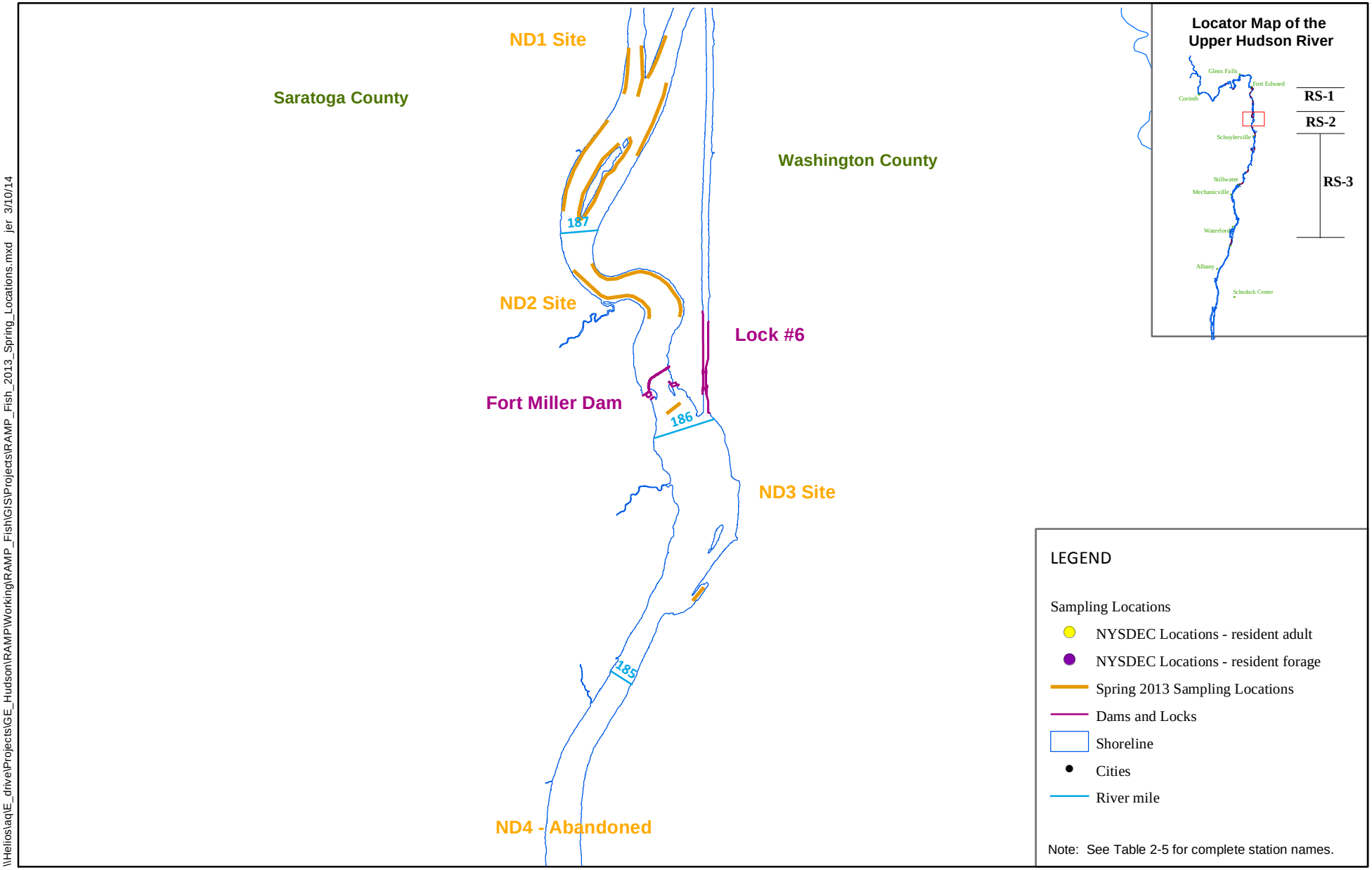
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5c

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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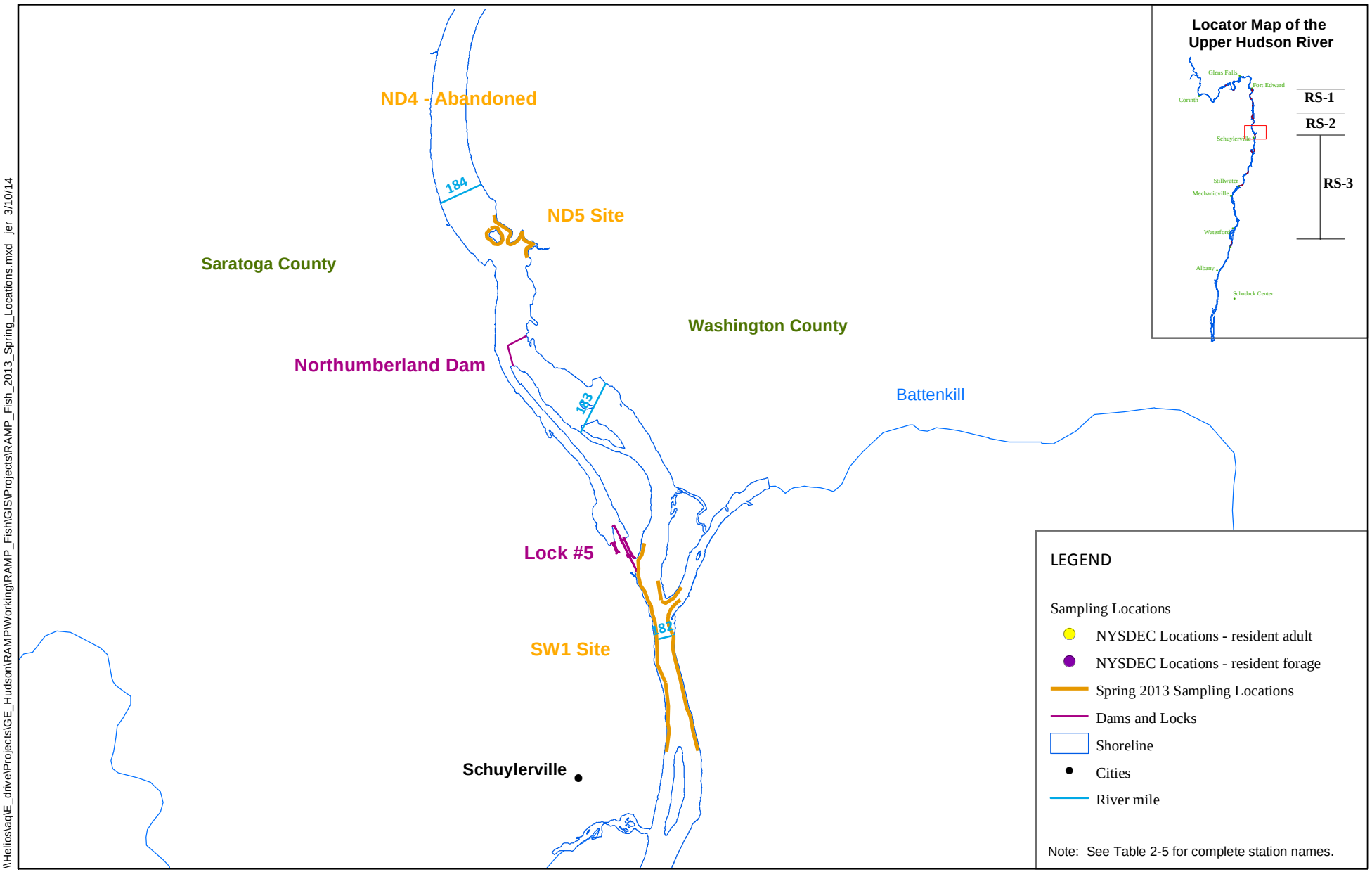
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5d

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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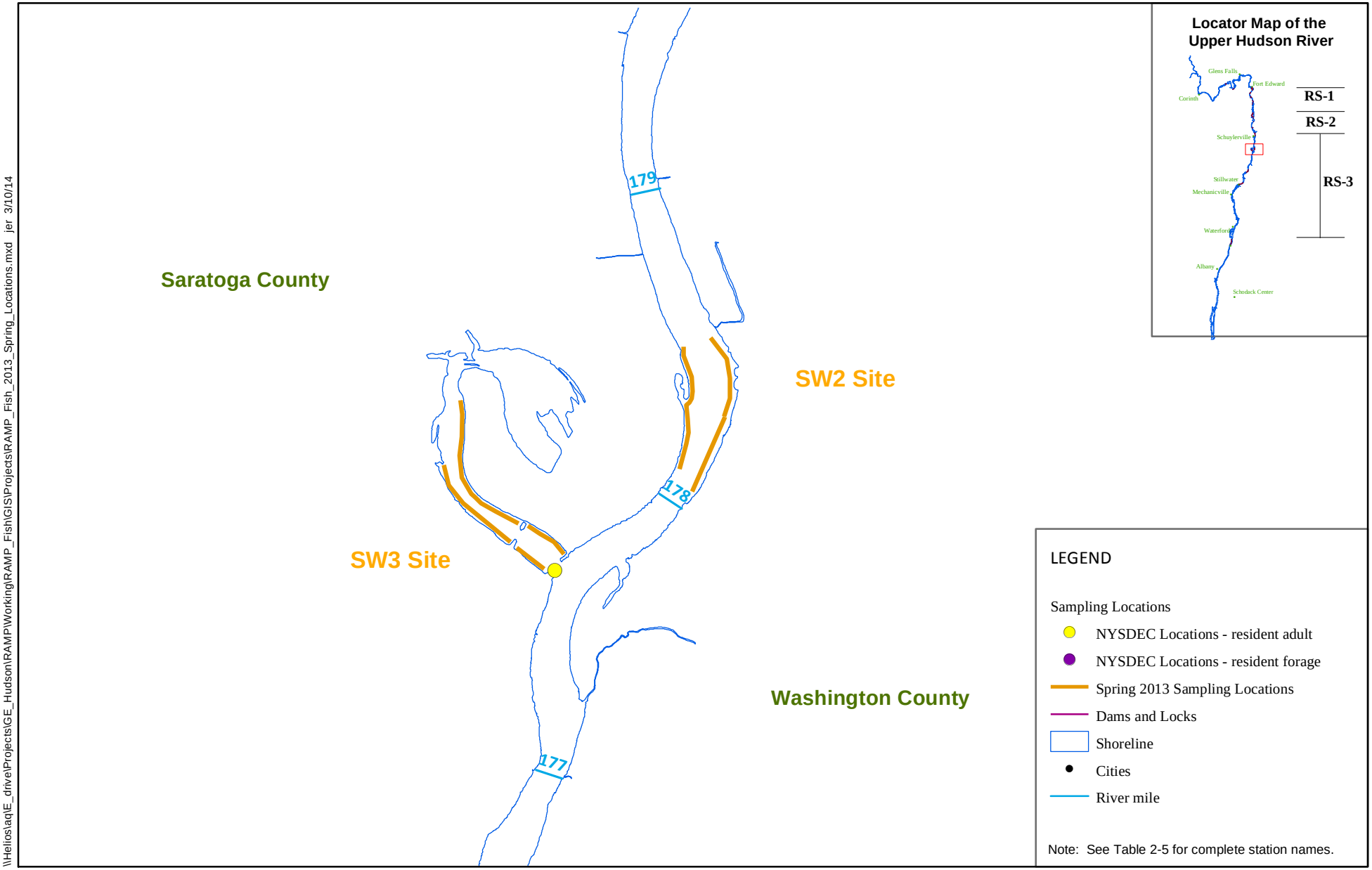
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5e

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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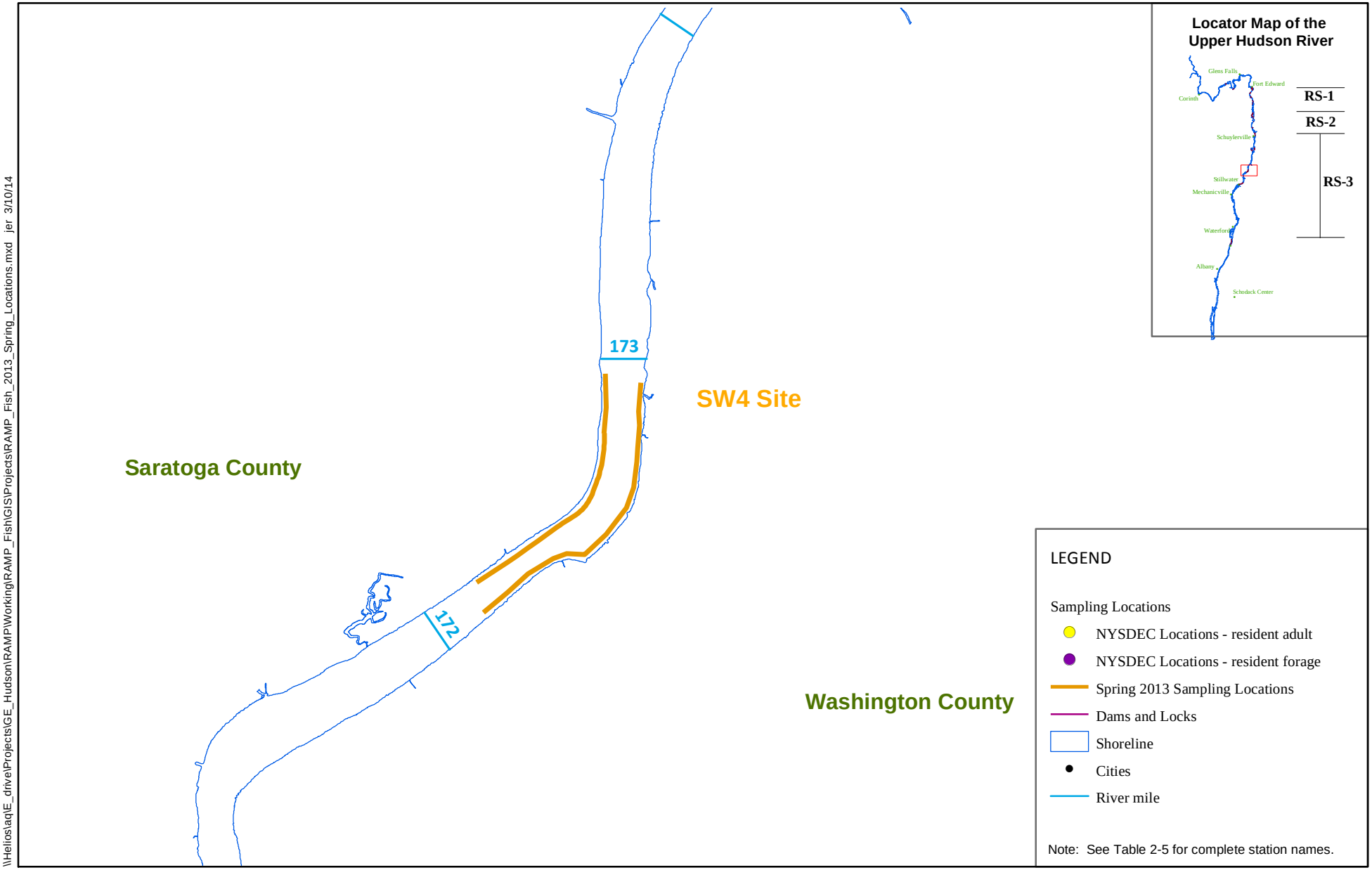
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5f

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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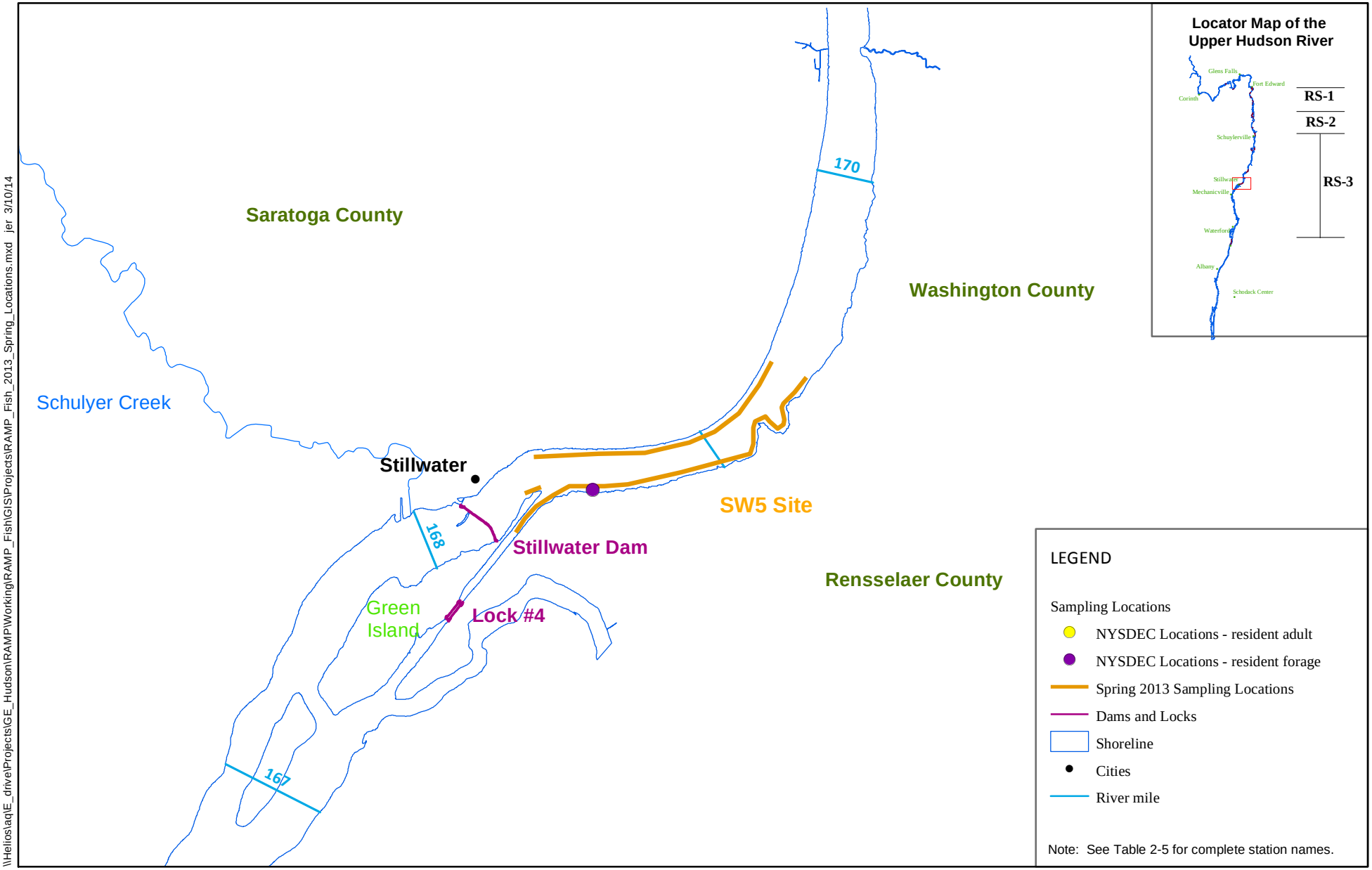
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5g

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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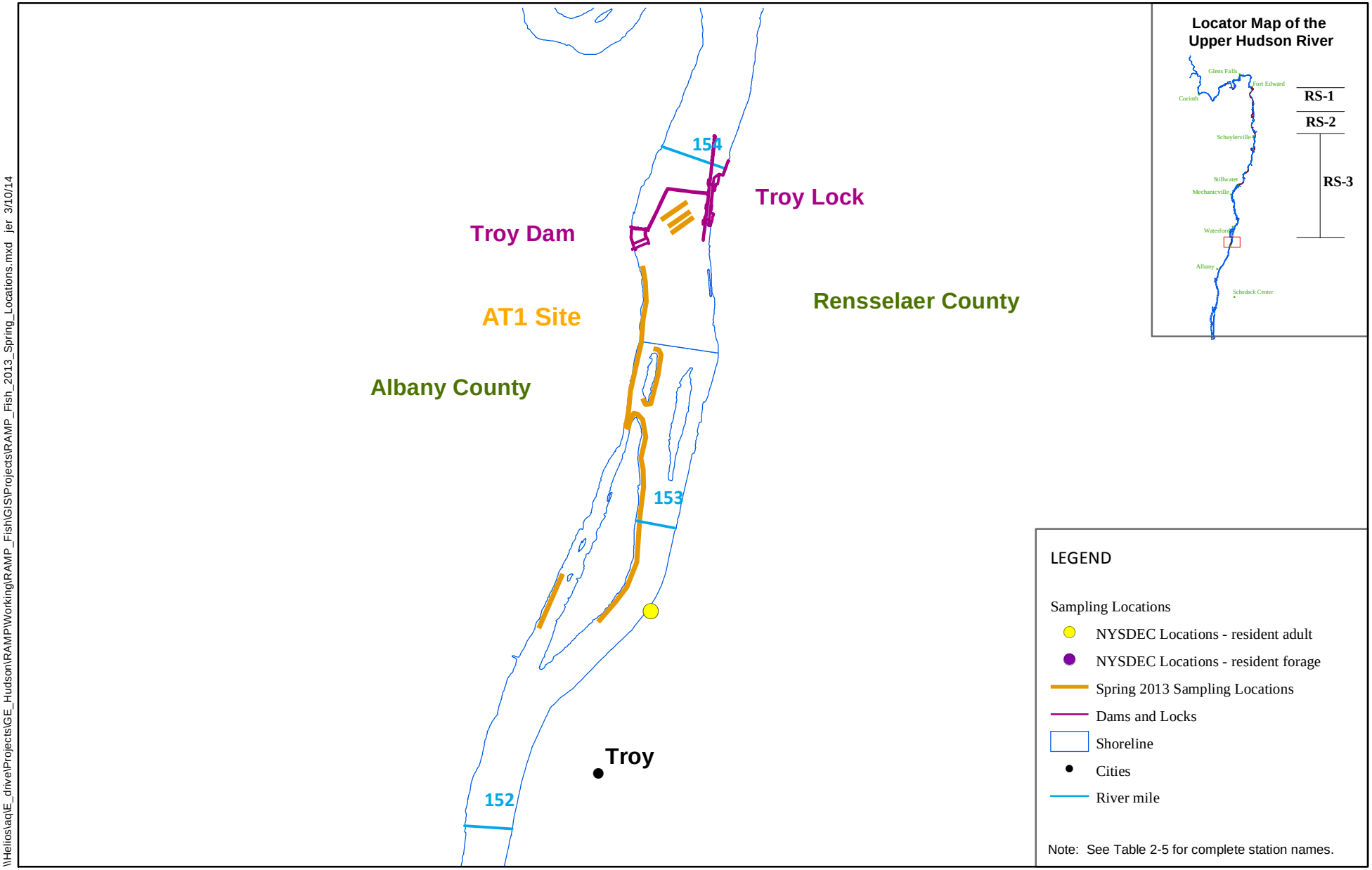
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5h

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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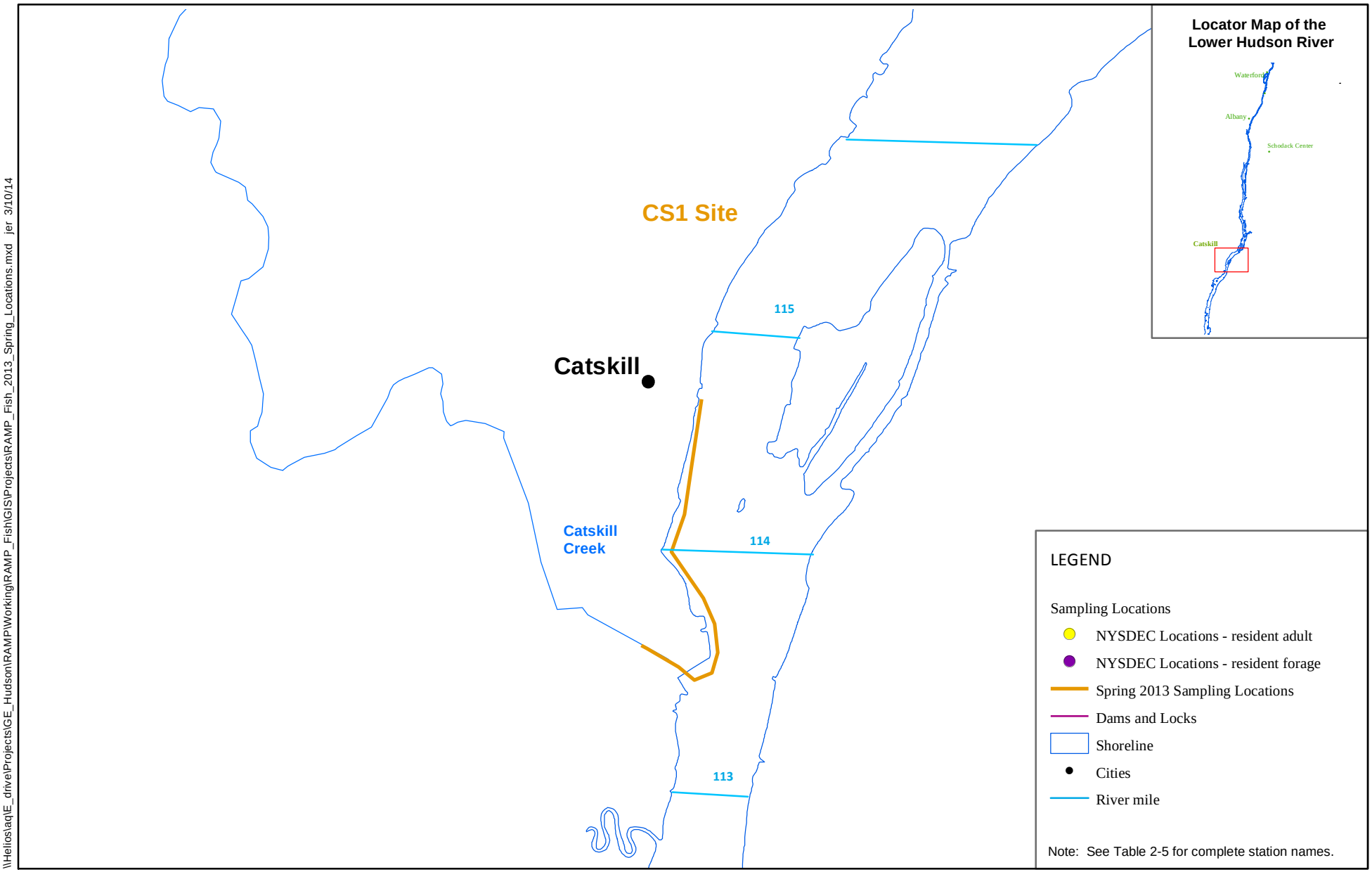
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5i

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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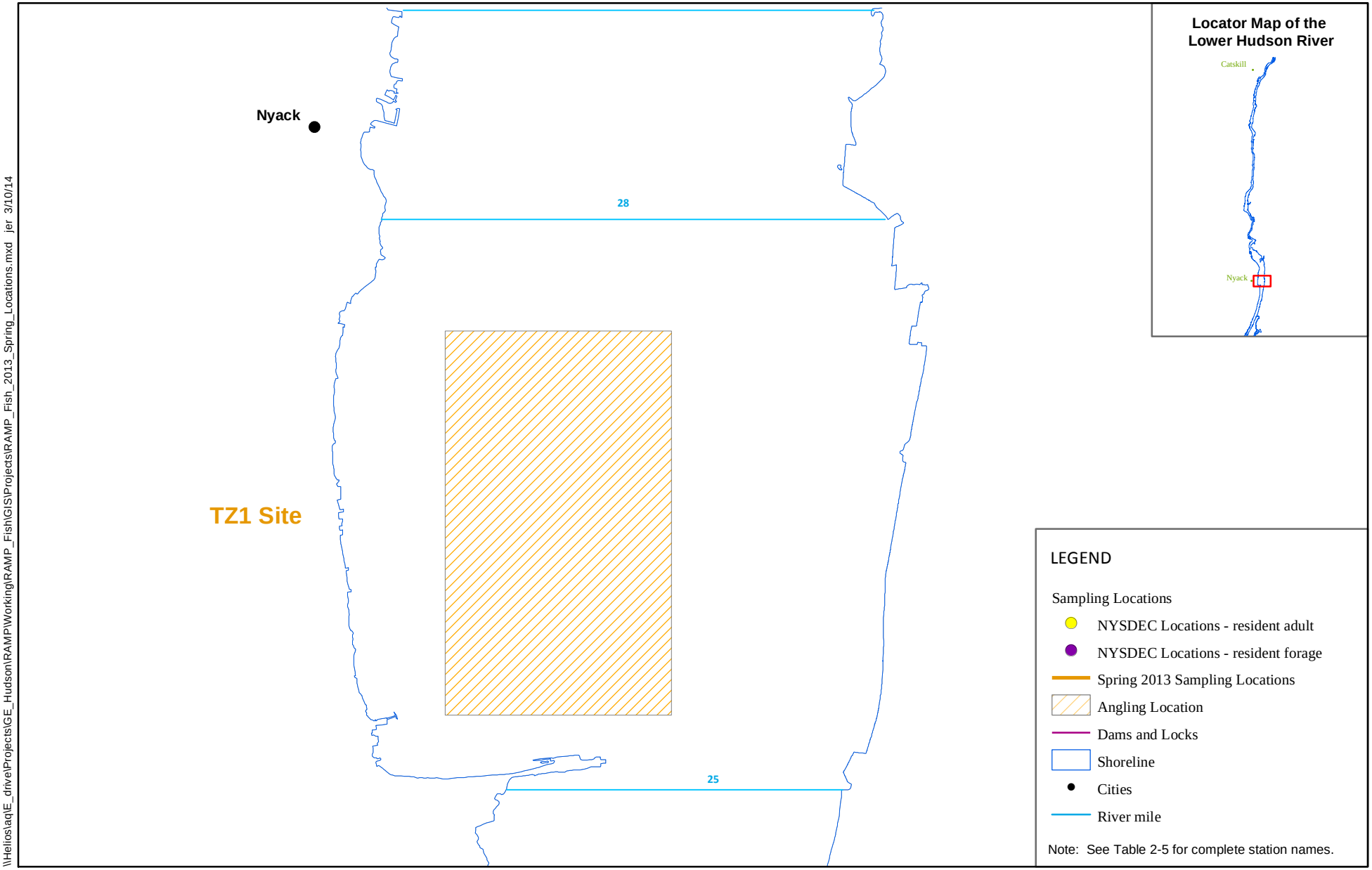
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5j

Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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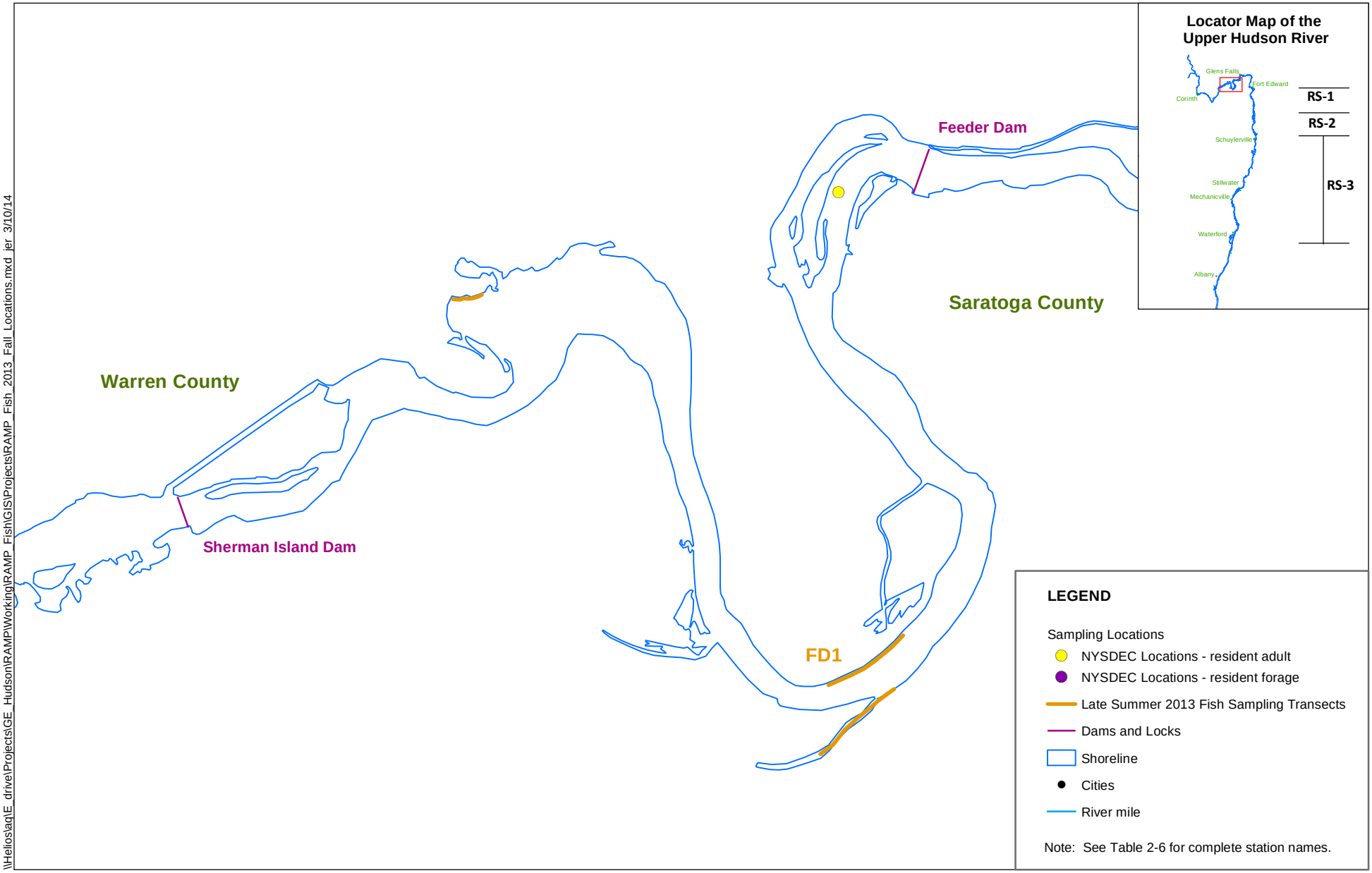
ANCHOR QEA

0 0.5 1 Miles

Figure 2-5k

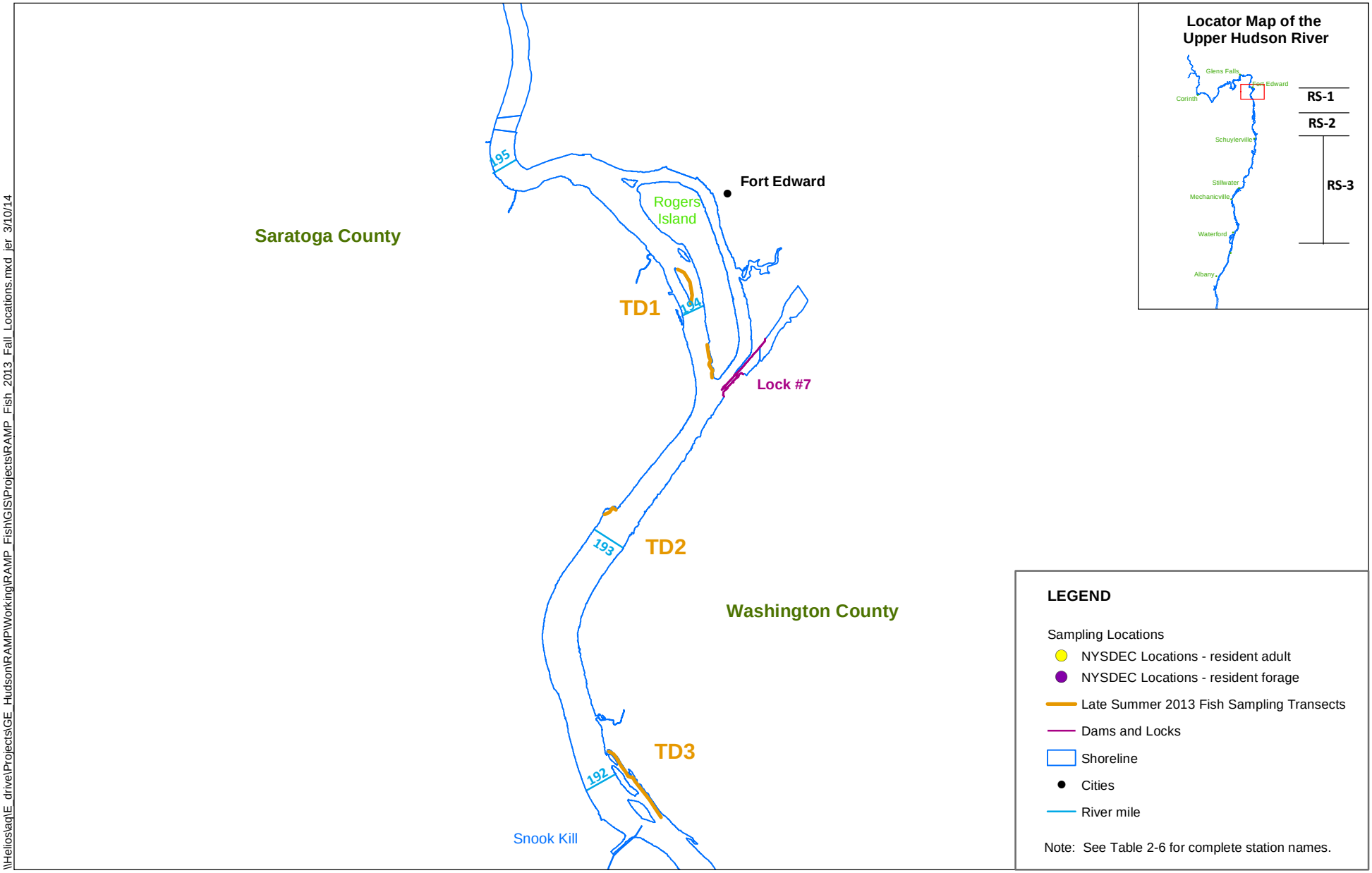
Spring 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



ANCHOR QEA

Miles
0 0.5 1

Figure 2-6a
Late Summer 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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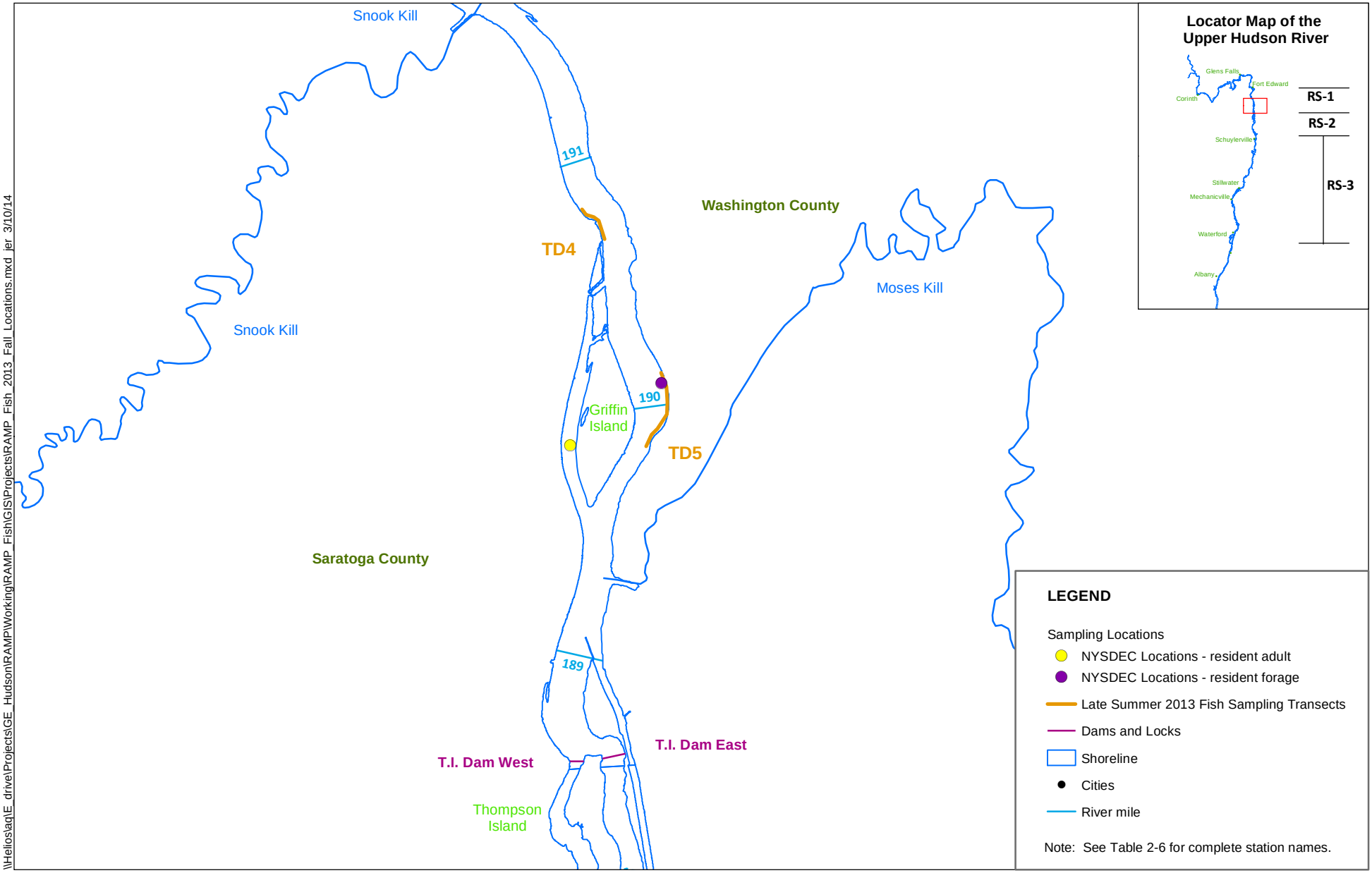
ANCHOR QEA

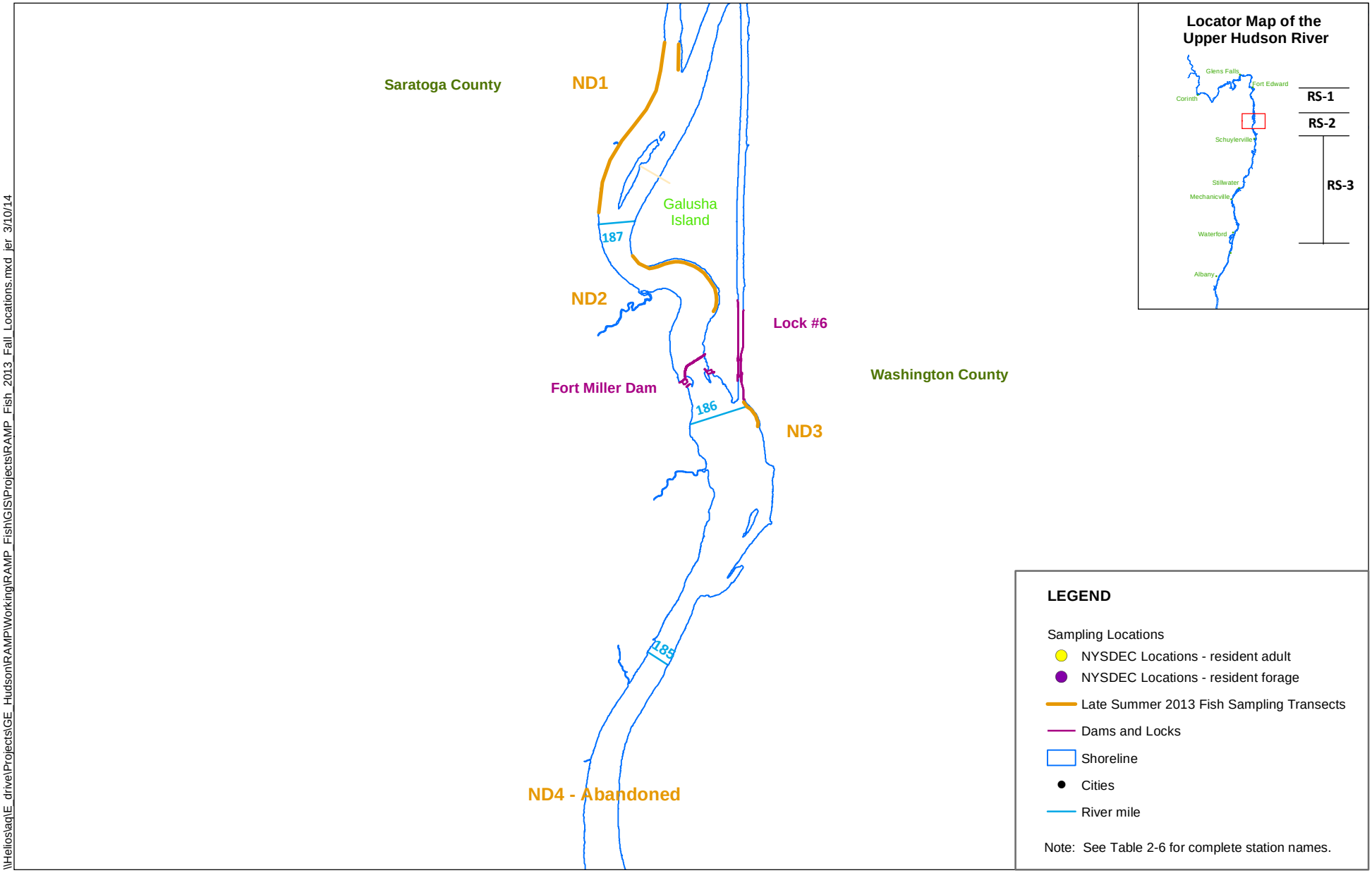
Figure 2-6b
Late Summer 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



ANCHOR QEA

Miles
0 0.5 1

Figure 2-6c
Late Summer 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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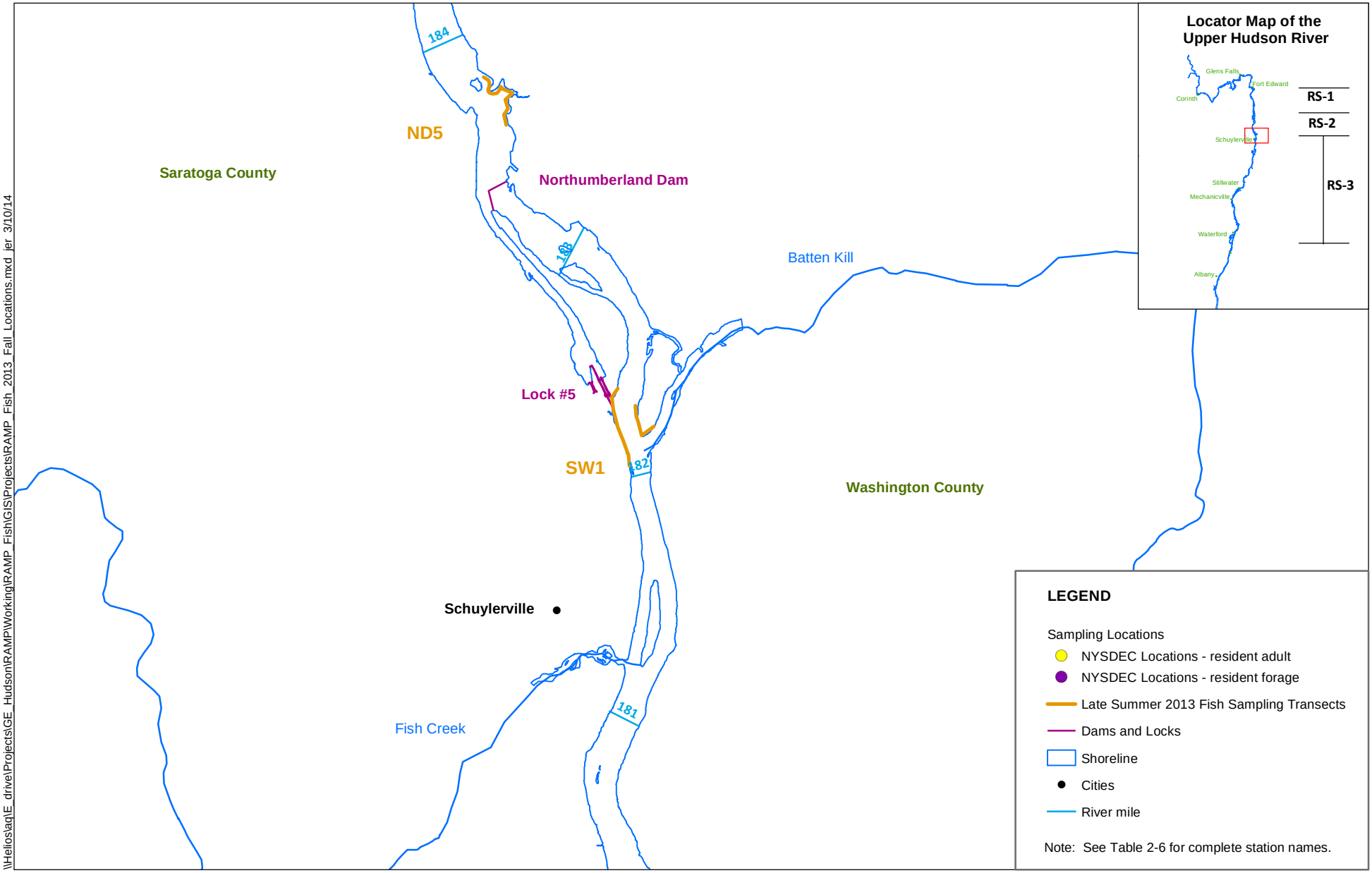
ANCHOR QEA

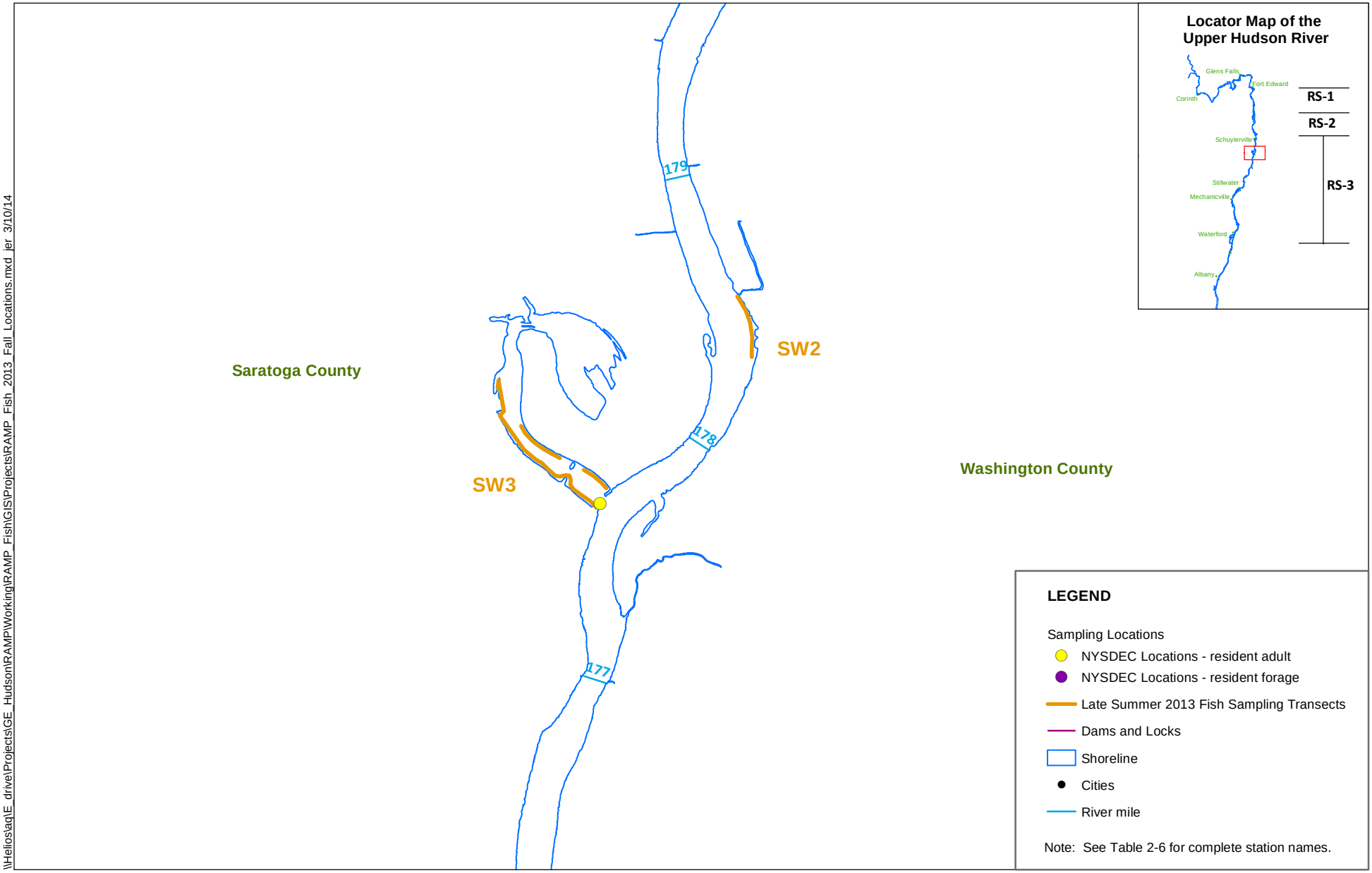
Figure 2-6d
Late Summer 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



ANCHOR QEA

Miles
0 0.5 1

Figure 2-6e
Late Summer 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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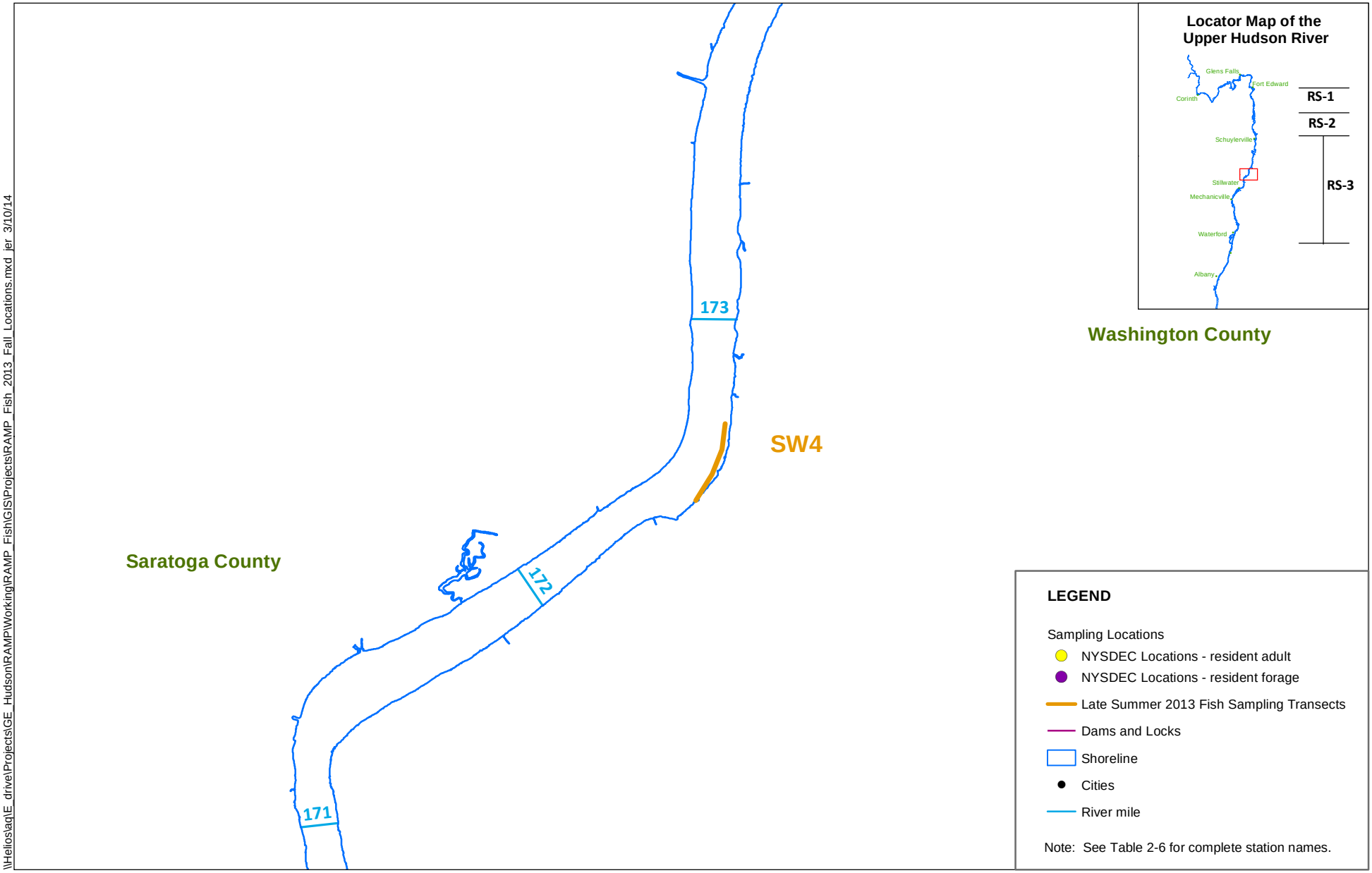
ANCHOR QEA

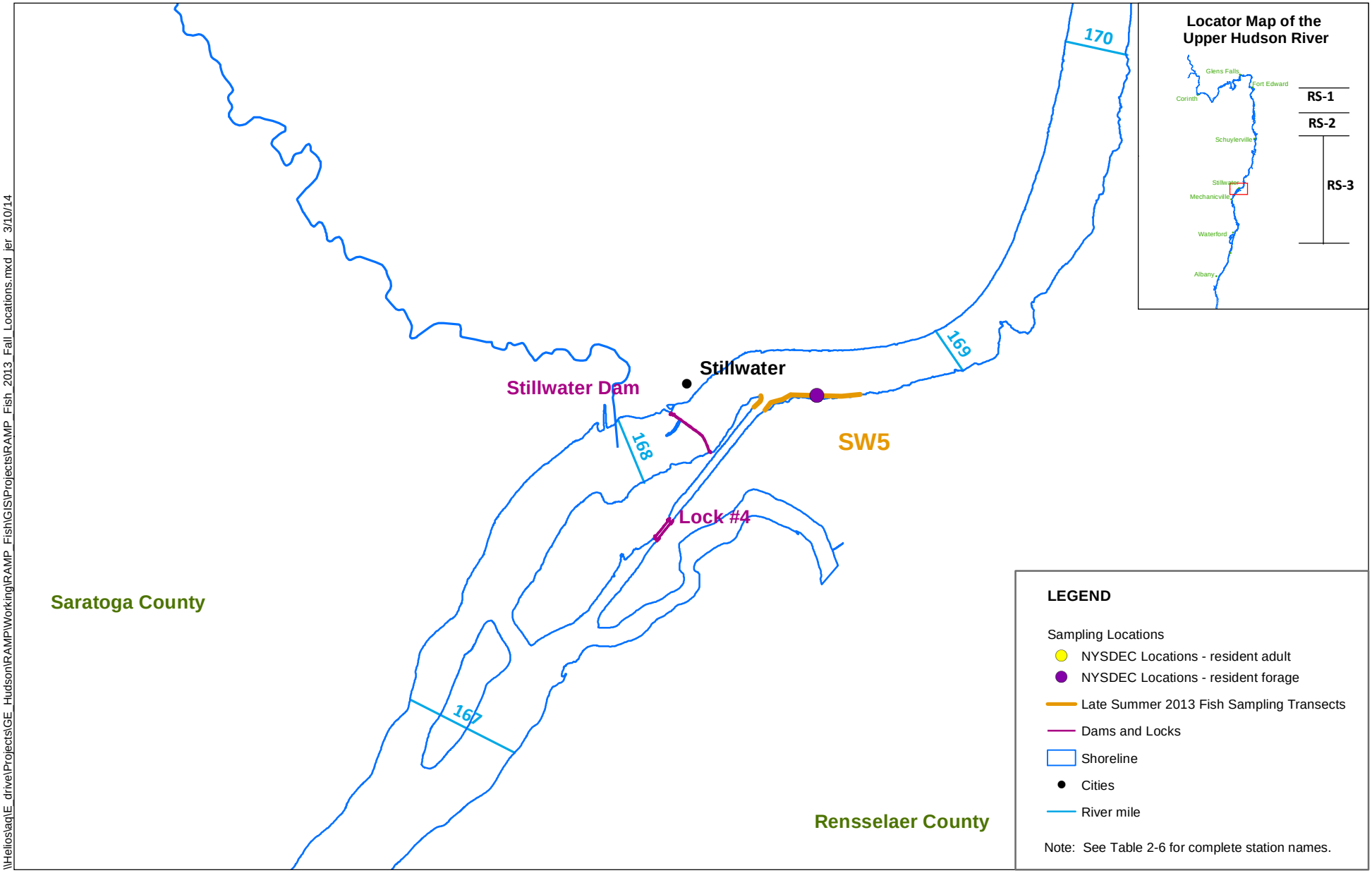
Figure 2-6f
Late Summer 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



ANCHOR QEA

Miles
0 0.5 1

Figure 2-6g
Late Summer 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company



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ANCHOR QEA

Figure 2-6h
Late Summer 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company

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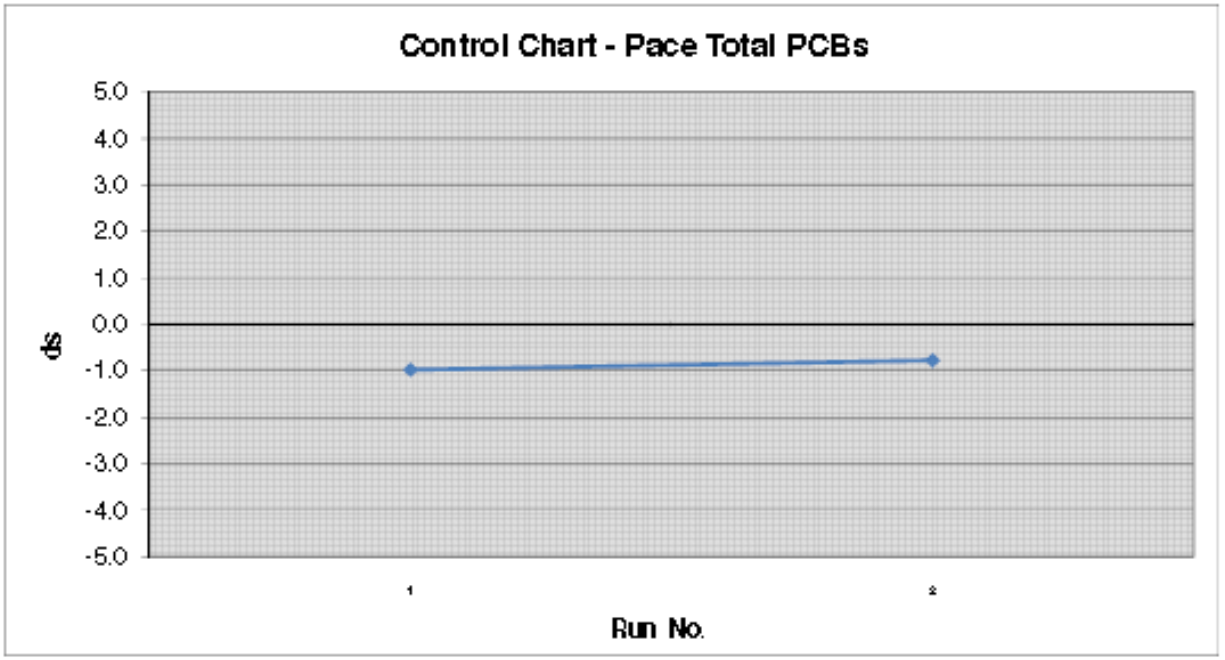
ANCHOR QEA

Figure 2-6i
Late Summer 2013 Fish Sampling Locations
2013 Data Summary Report
Prepared for the General Electric Company

Analysis Date	PE #	Run#	s	Total PCB
9/27/2013	PE25	1	-0.98	0.73
9/31/2013	PE26	2	-0.78	0.75

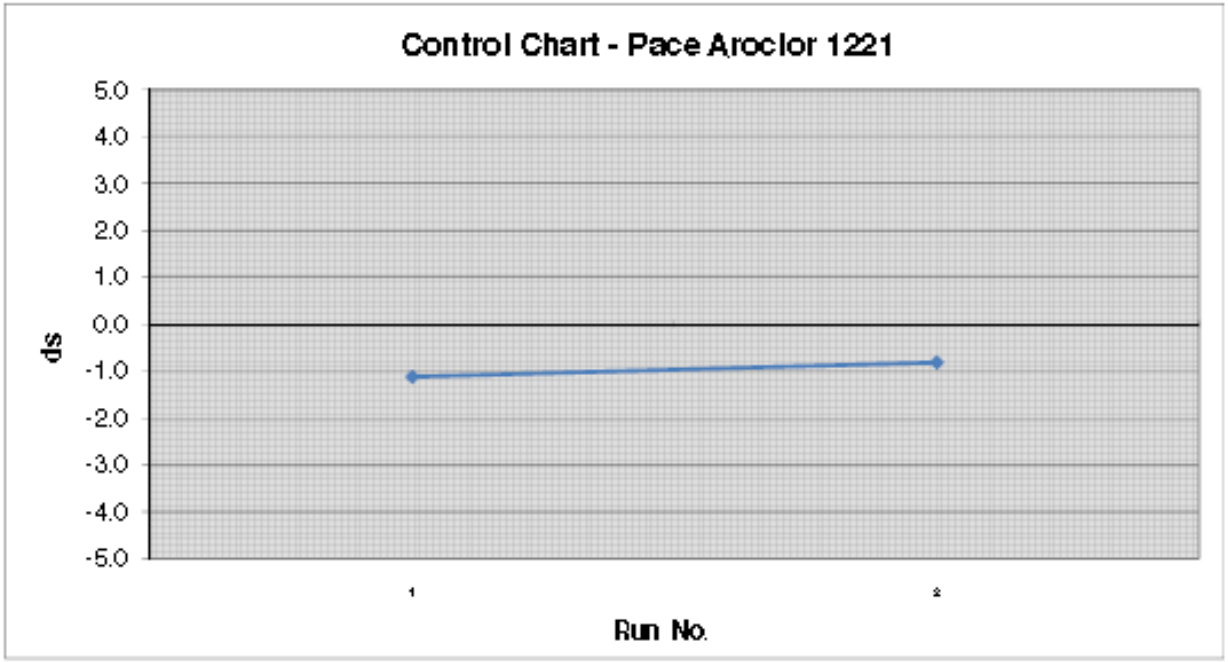


No	Current Point outside +/- 3 Sigma?
No	2 of last 3 points outside +/- 2 Sigma on same side of mean?
No	4 of last 5 points outside +/- 1 Sigma on same side of mean?
No	9 consecutive points on the same side of mean?
No	6 points in a row all increasing or decreasing?
No	14 points in a row alternating up and down?

ENVIRONMENTAL STANDARDS®

Figure 3-1
GEHR8082 PE CONTROL CHART - 2013 DDS Program Sediment Samples - Total PCBs
2013 Data Summary Report
Prepared for the General Electric Company

Analysis Date	PE #	Run #	s	Aroclor 1221
9/27/2013	PE25	1	-1.12	0.52
9/31/2013	PE26	2	-0.81	0.57



No	Current Point outside +/- 3 Sigma?
No	2 of last 3 points outside +/- 2 Sigma on same side of mean?
No	4 of last 5 points outside +/- 1 Sigma on same side of mean?
No	9 consecutive points on the same side of mean?
No	6 points in a row all increasing or decreasing?
No	14 points in a row alternating up and down?

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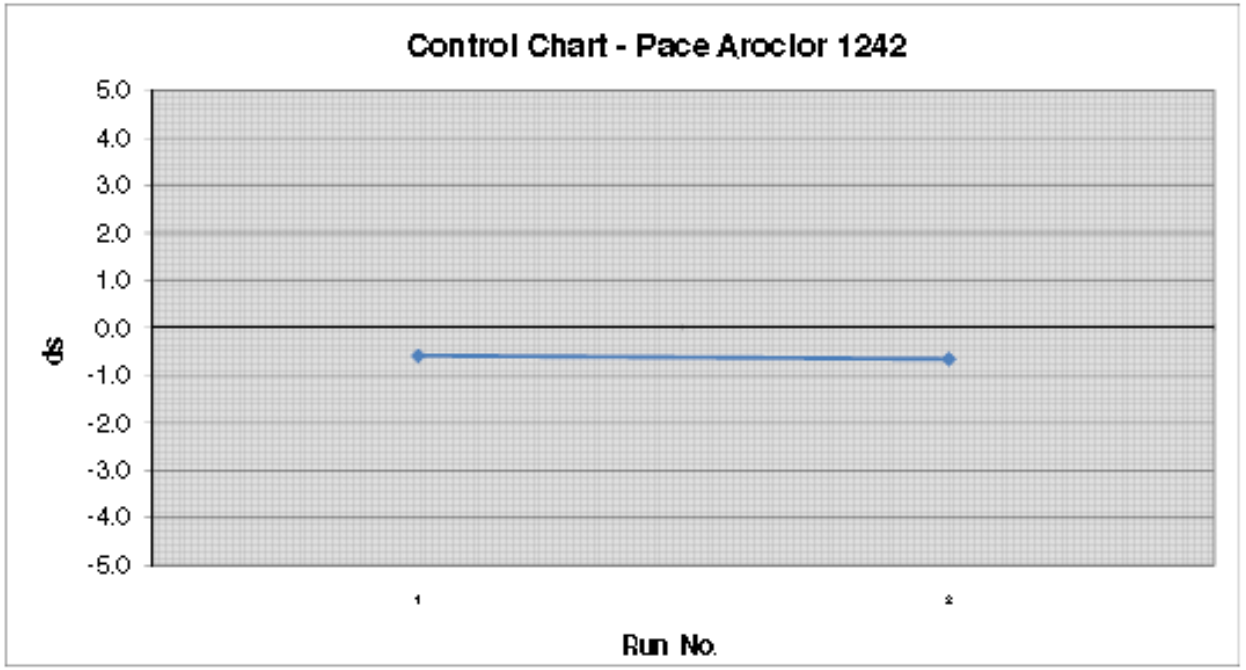
Figure 3-2
GEHR8082 PE CONTROL CHART - 2013 DDS Program Sediment Samples – Aroclor 1221
2013 Data Summary Report
Prepared for the General Electric Company

Analysis Date	PE #	Run #	S	Aroclor 1242
9/27/2013	PE25	1	-0.59	0.21
9/31/2013	PE26	2	-0.65	0.19



No	Current Point outside +/- 3 Sigma?
No	2 of last 3 points outside +/- 2 Sigma on same side of mean?
No	4 of last 5 points outside +/- 1 Sigma on same side of mean?
No	9 consecutive points on the same side of mean?
No	6 points in a row all increasing or decreasing?
No	14 points in a row alternating up and down?

Figure 3-3
GEHR8082 PE CONTROL CHART - 2013 DDS Program Sediment Samples – Aroclor 1242
2013 Data Summary Report
Prepared for the General Electric Company

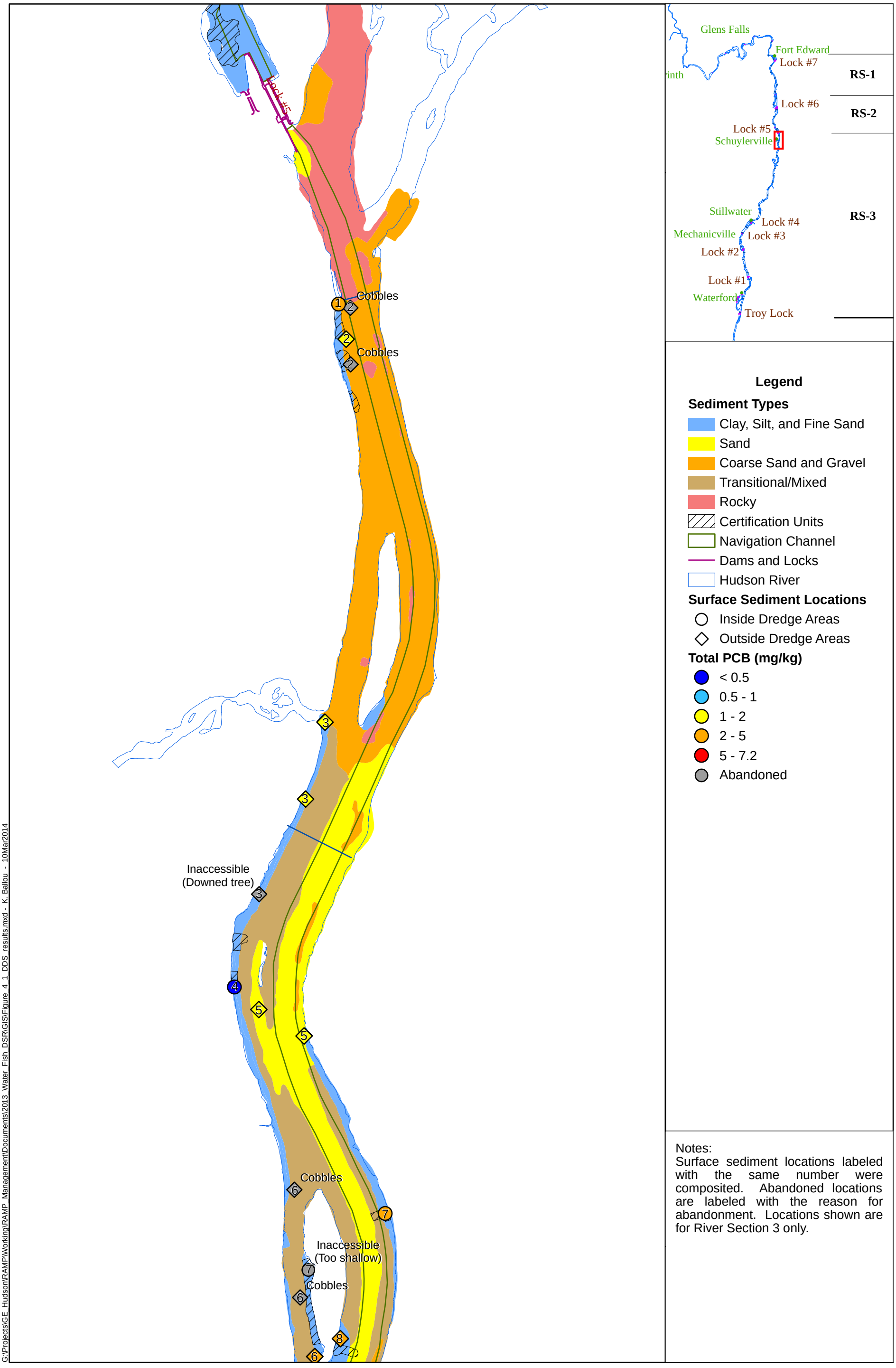


Figure 4-1a
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

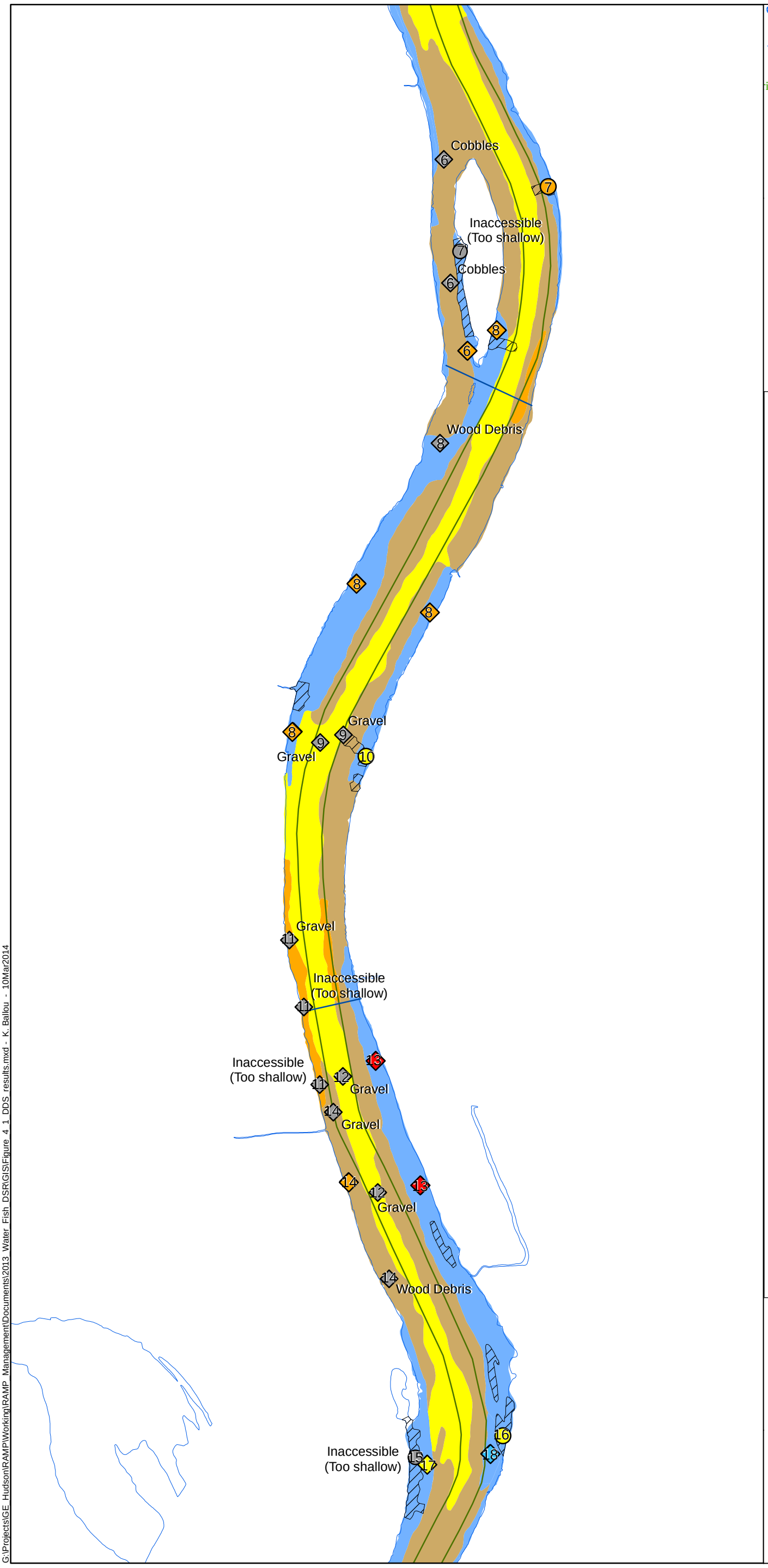


Figure 4-1b
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

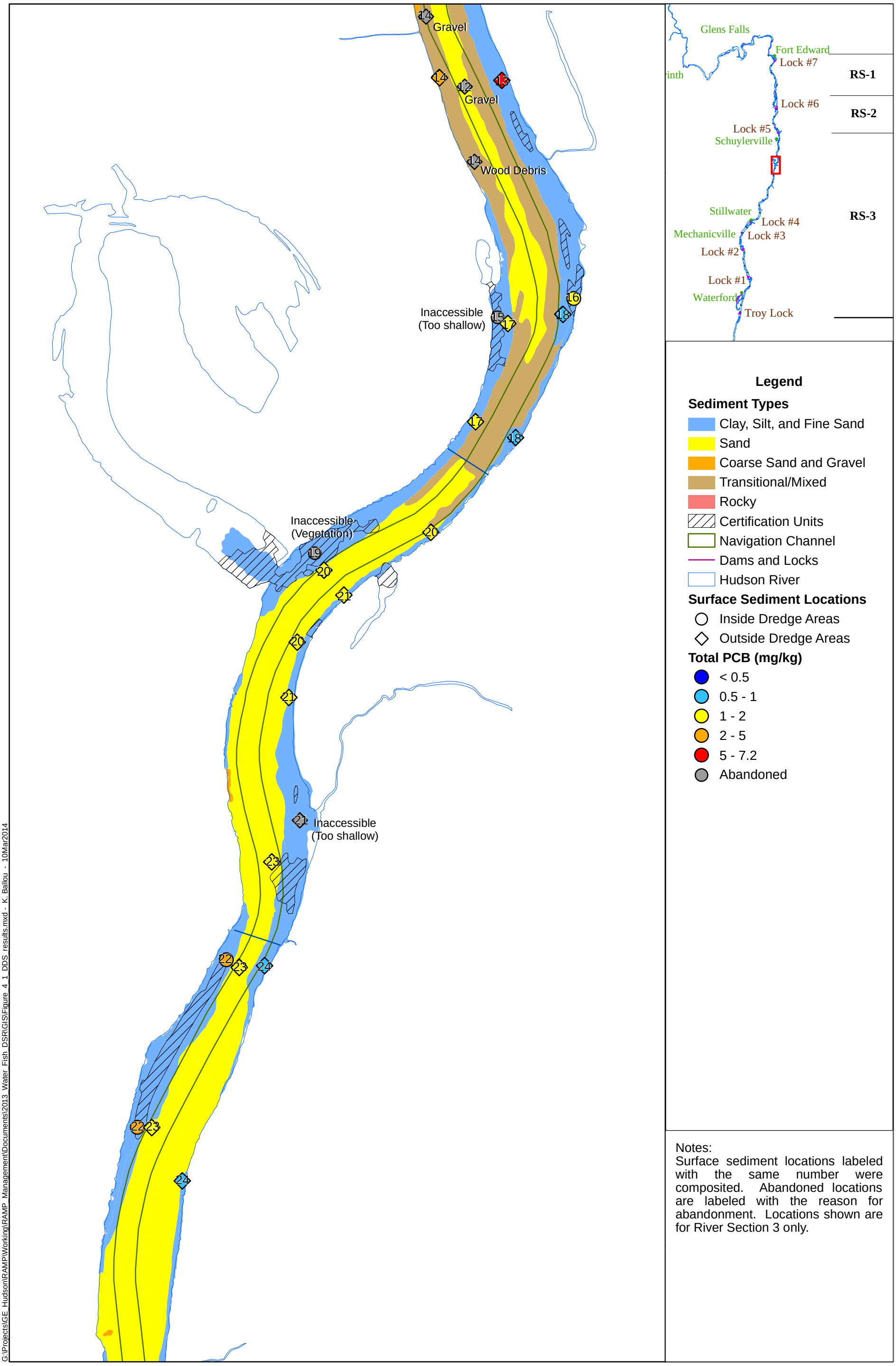


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Figure 4-1c
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

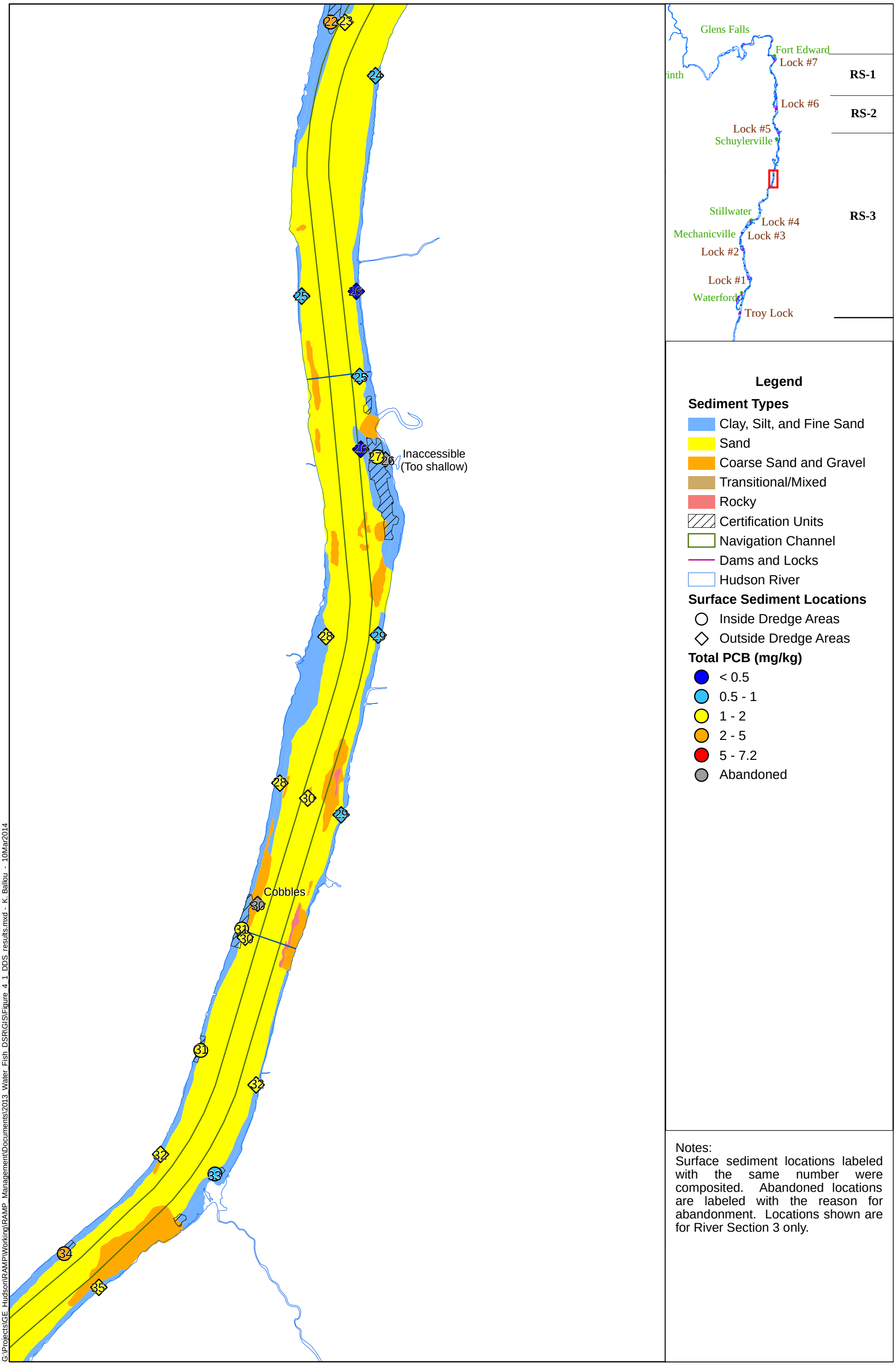

Figure 4-1d
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

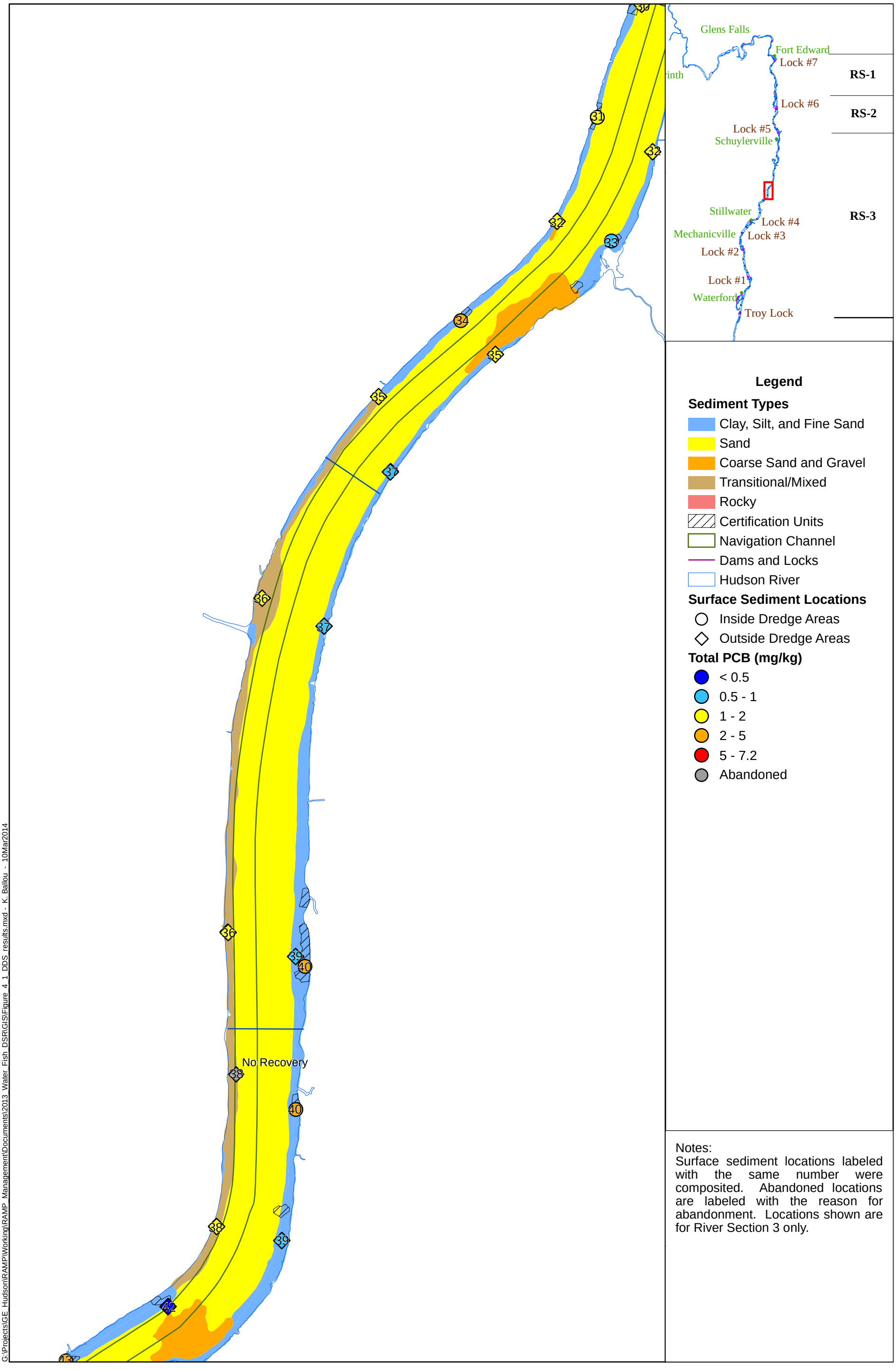

Figure 4-1e
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

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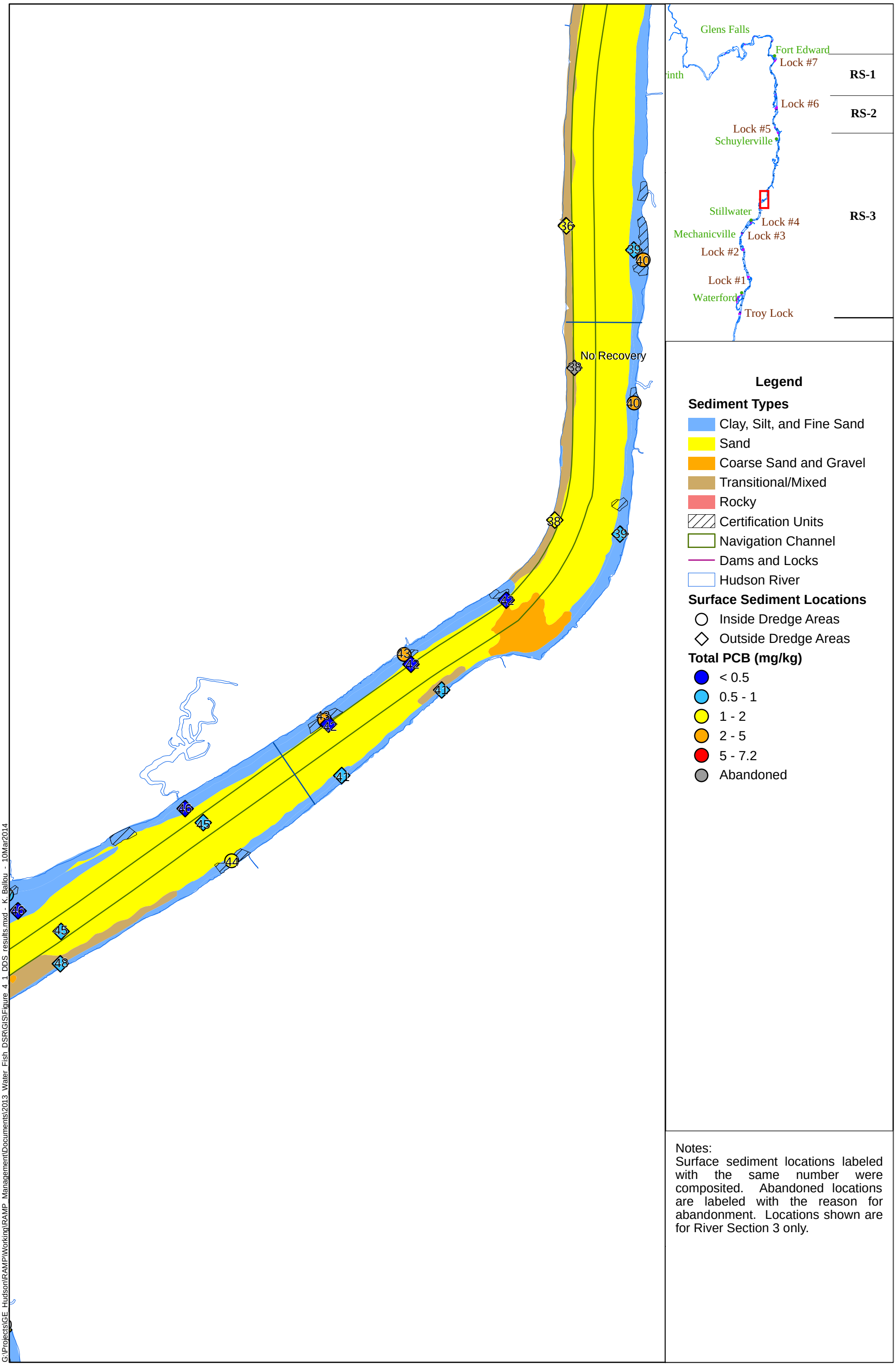
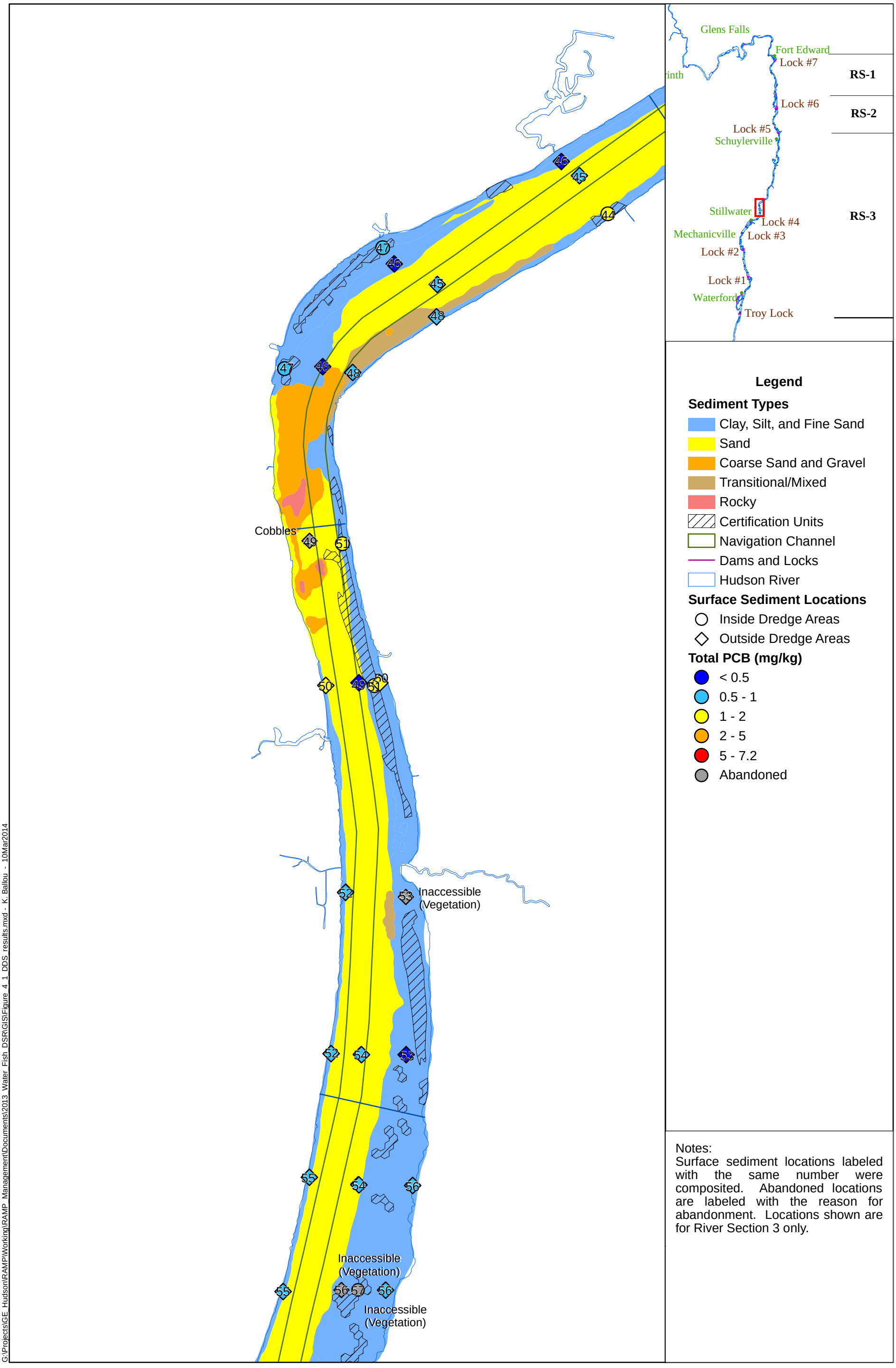


ANCHOR QEA

Feet
0 500 1,000 2,000

Figure 4-1f
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company



Notes:
Surface sediment locations labeled with the same number were composited. Abandoned locations are labeled with the reason for abandonment. Locations shown are for River Section 3 only.

G:\Projects\GE_Hudson\RAMP\Working\RAMP_Management\Documents\2013_Water_Fish_DSR\GIS\Figure_4-1_DDS_results.mxd - K. Ballou - 10Mar2014

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Feet
0 500 1,000 2,000

Figure 4-1g
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

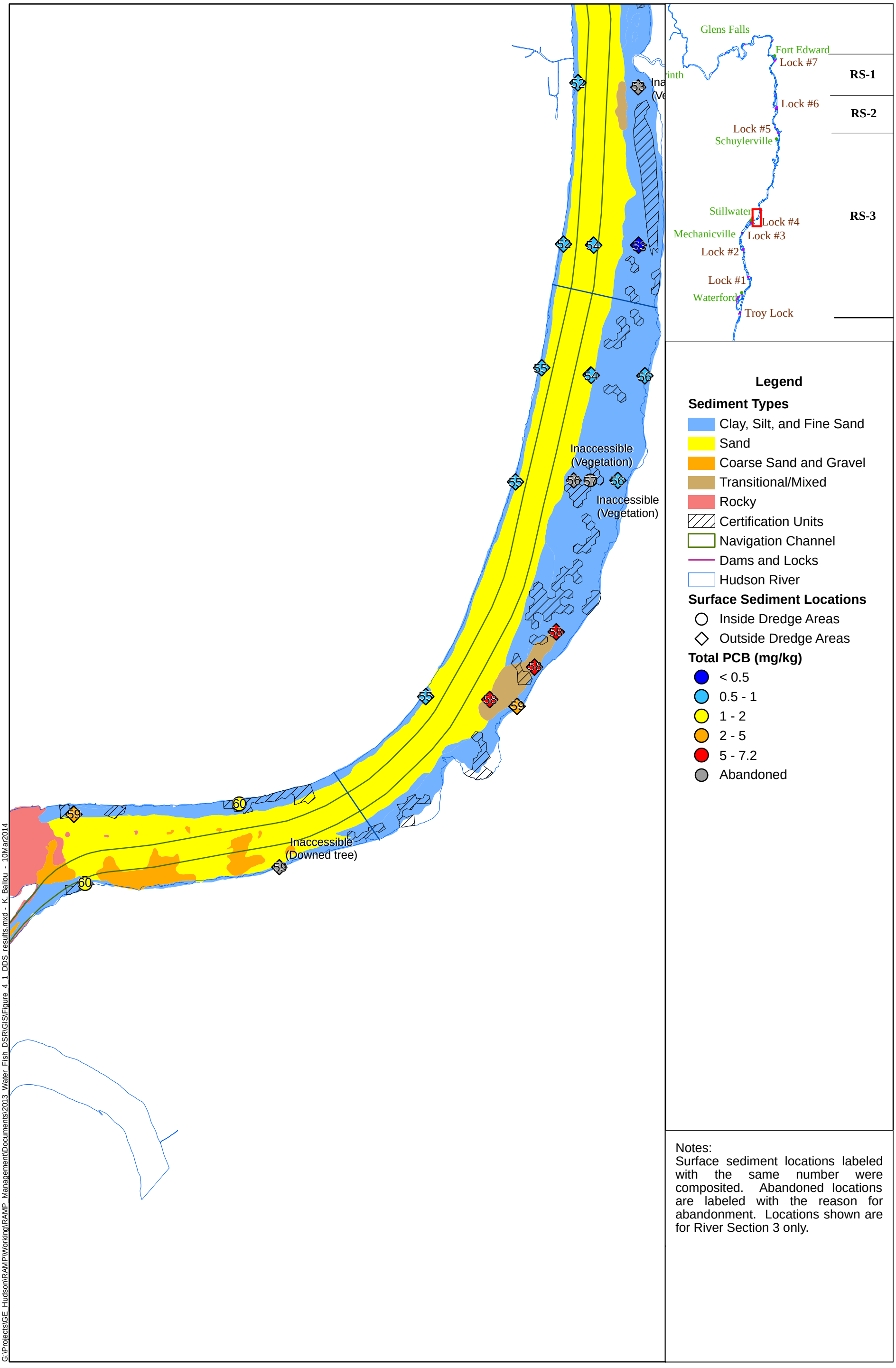


Figure 4-1h
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

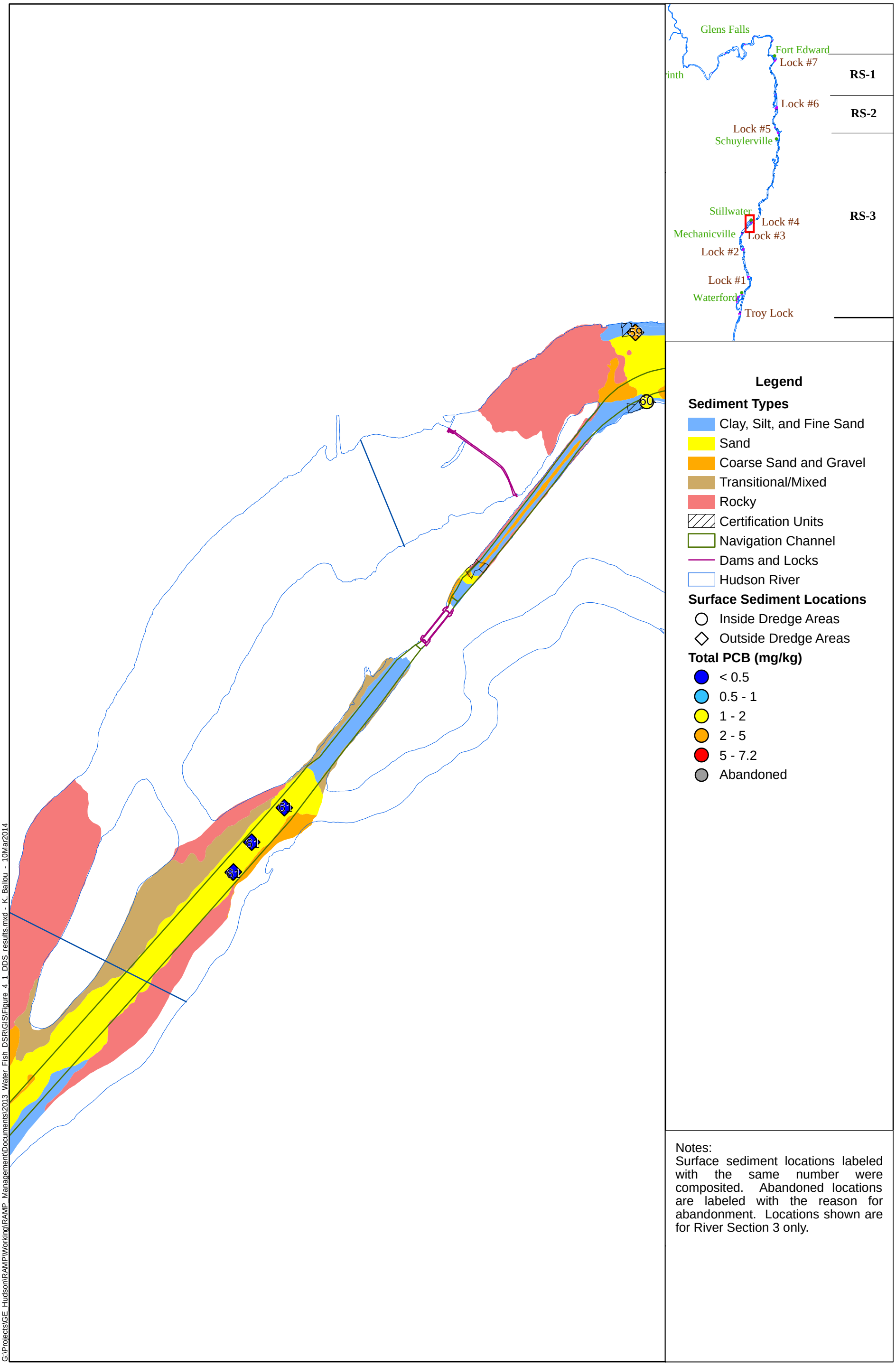
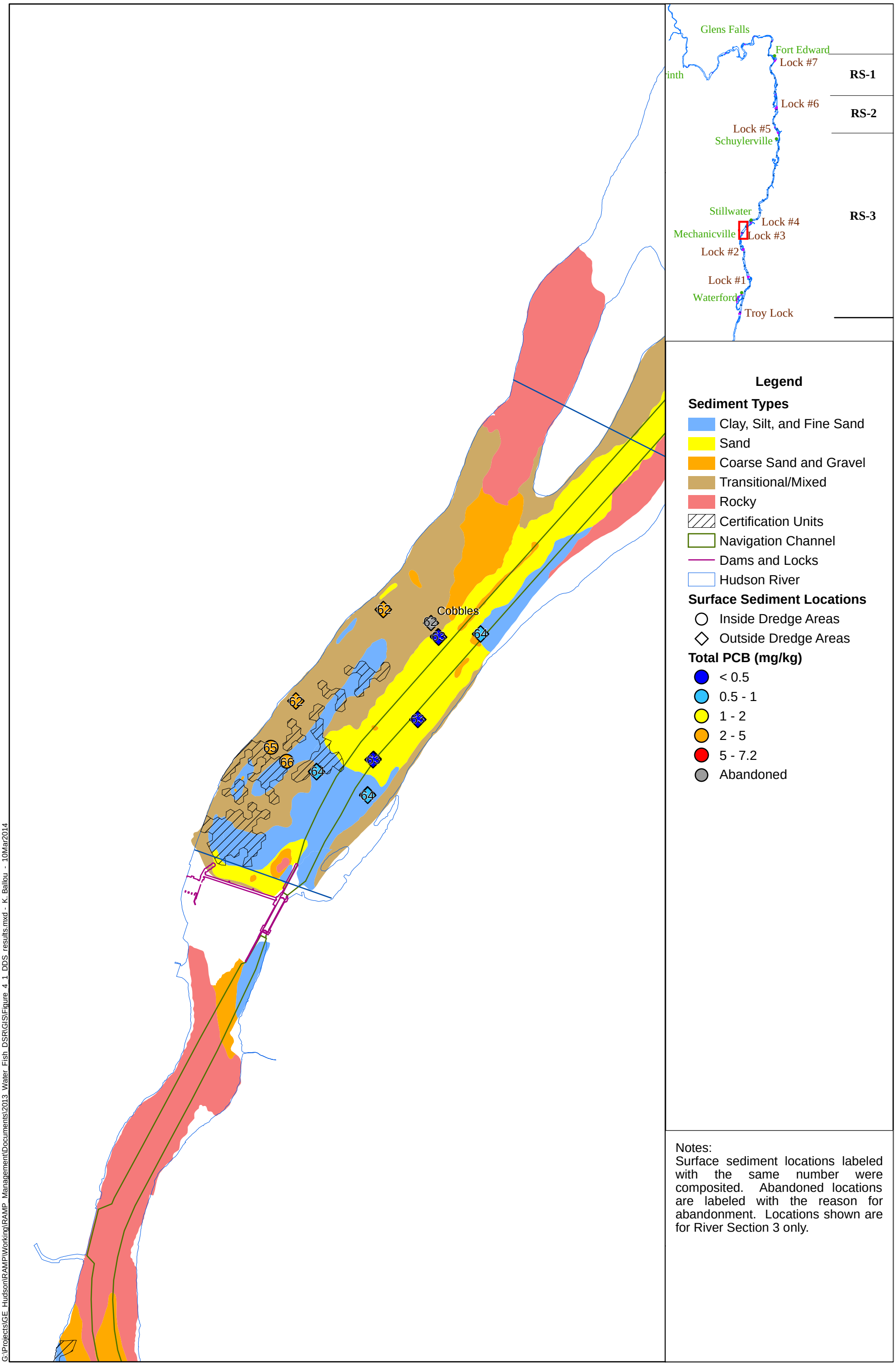


Figure 4-1i
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company



Feet
0 500 1,000 2,000

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Figure 4-1j
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

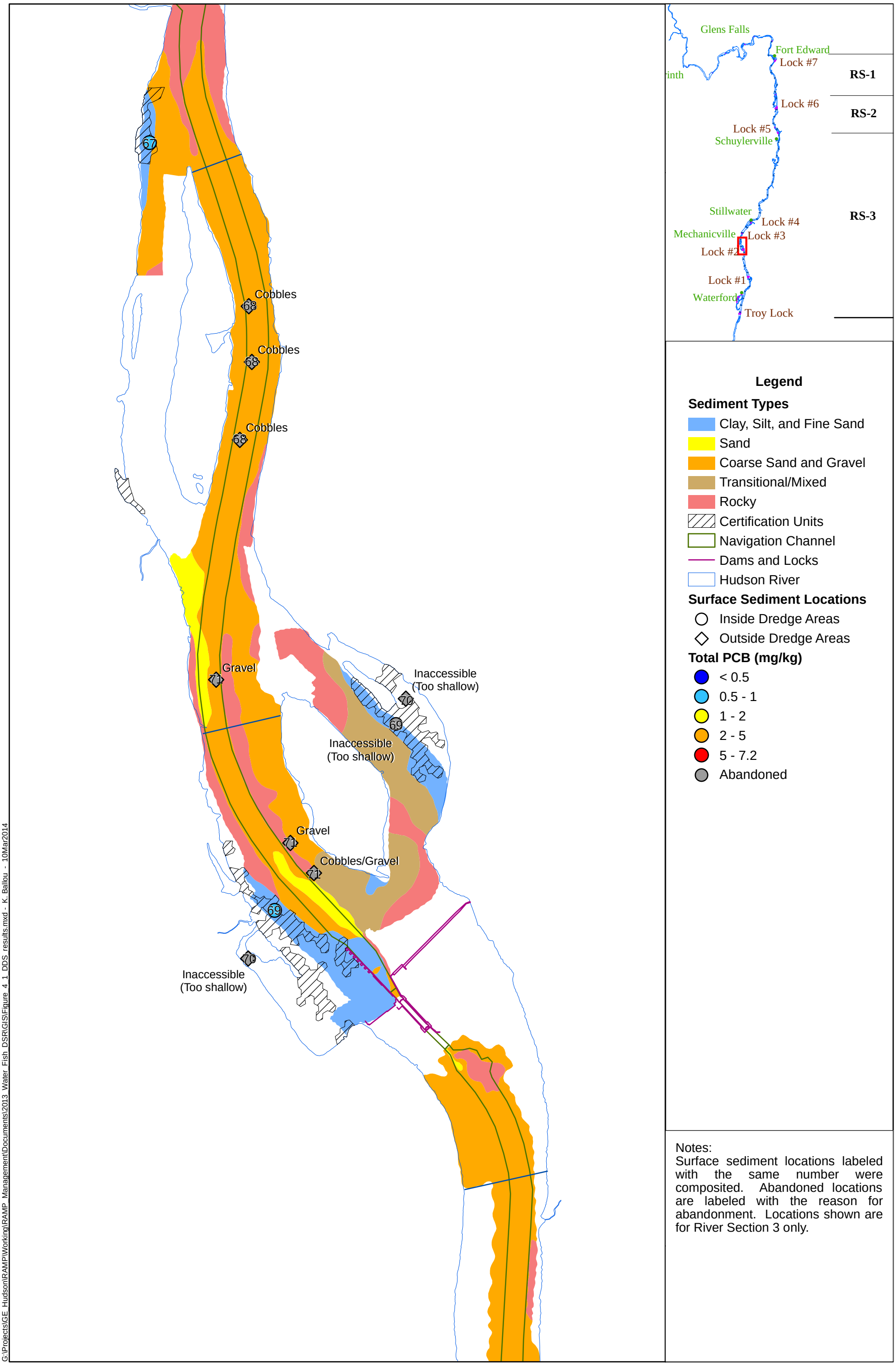

Figure 4-1k
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

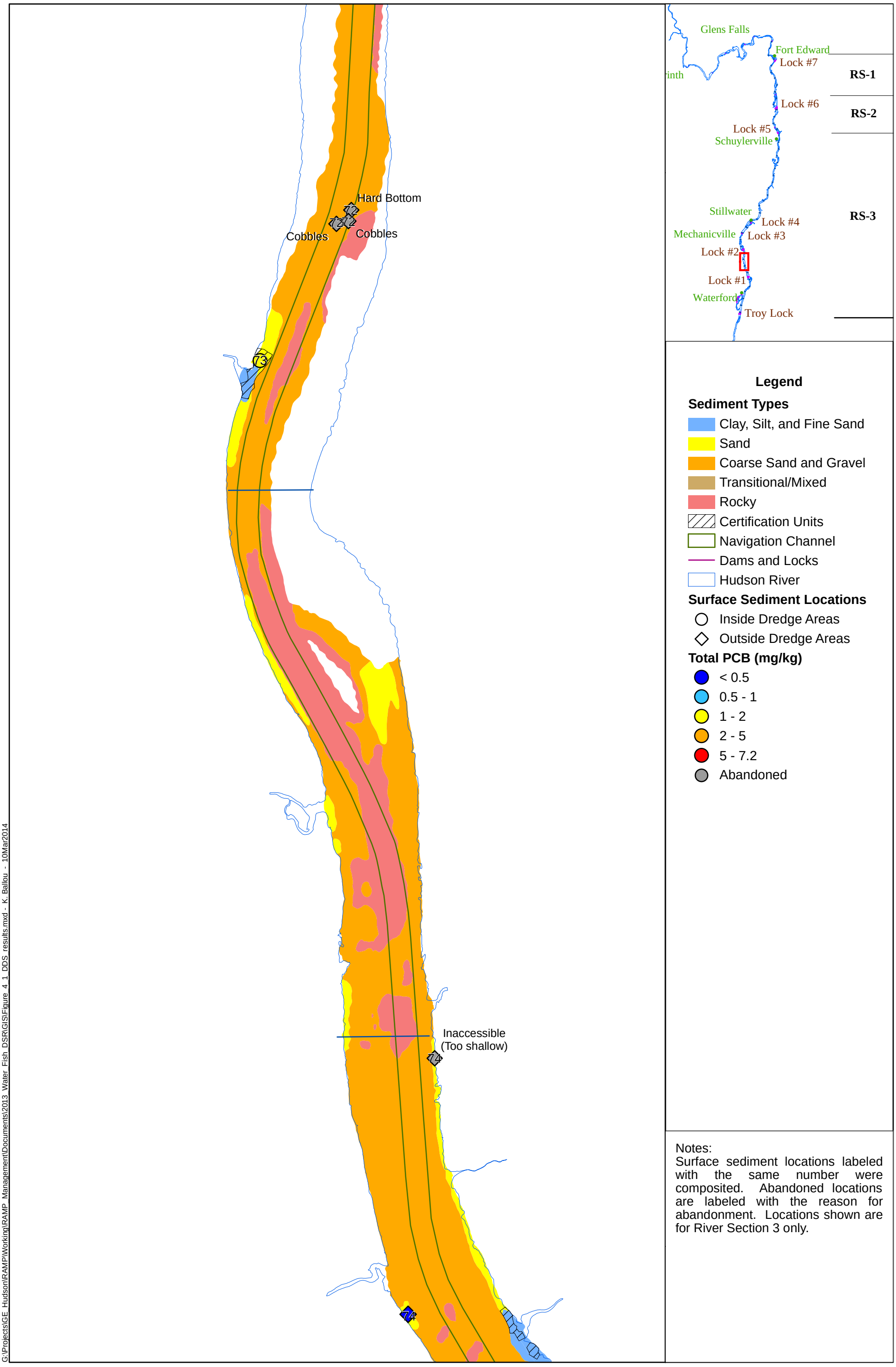

Figure 4-1l
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

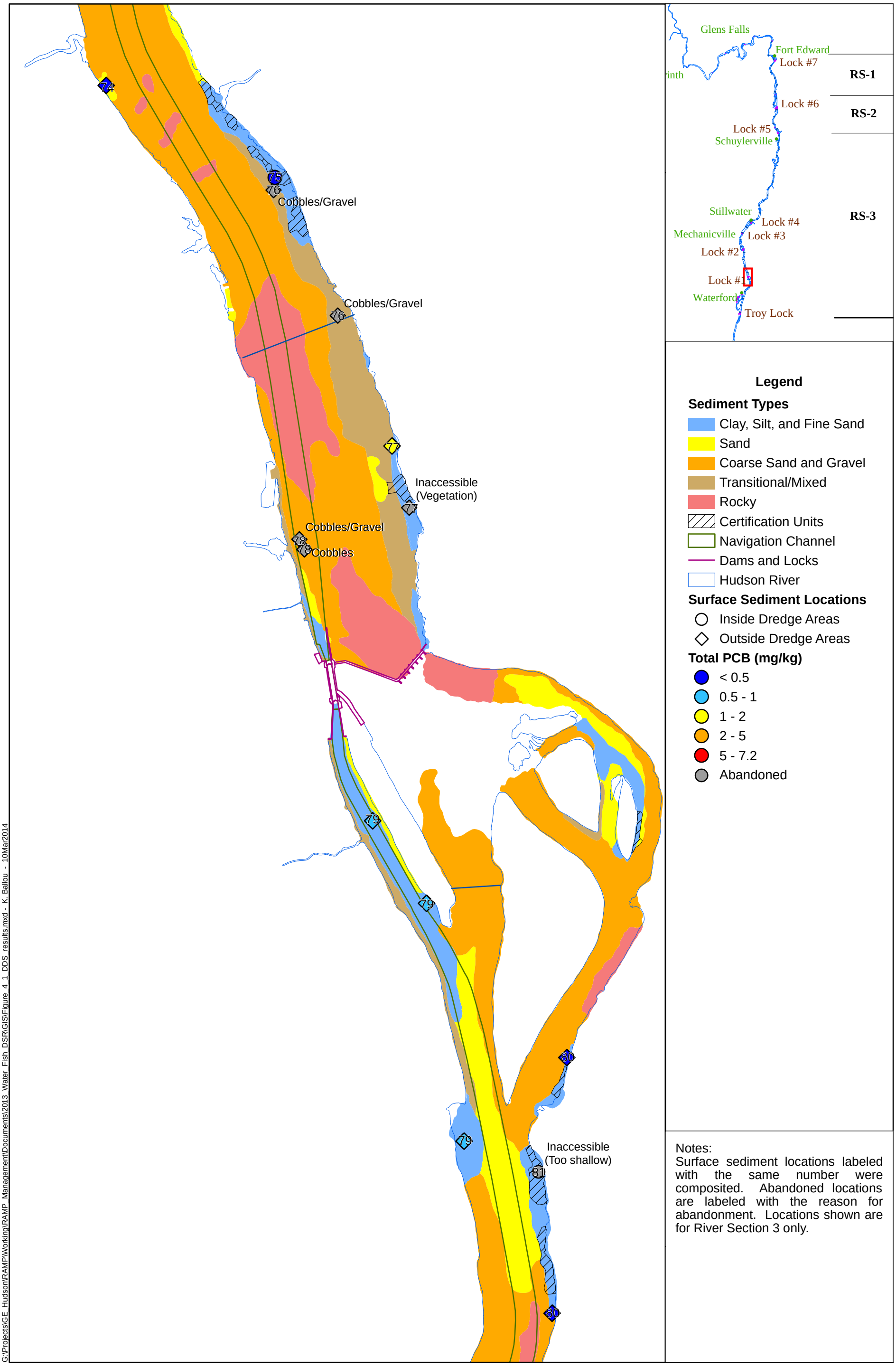

Figure 4-1m
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

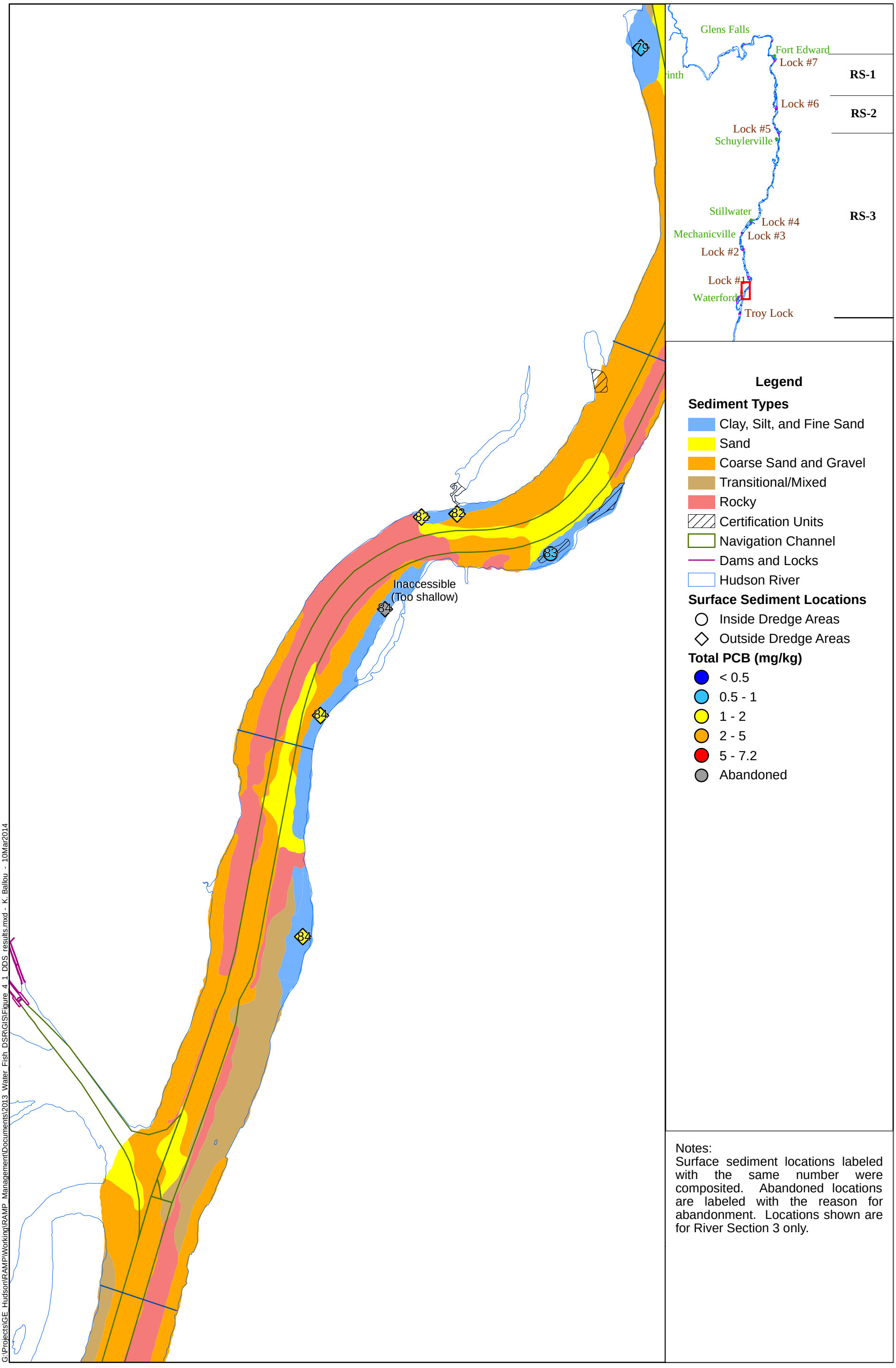

Figure 4-1n
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

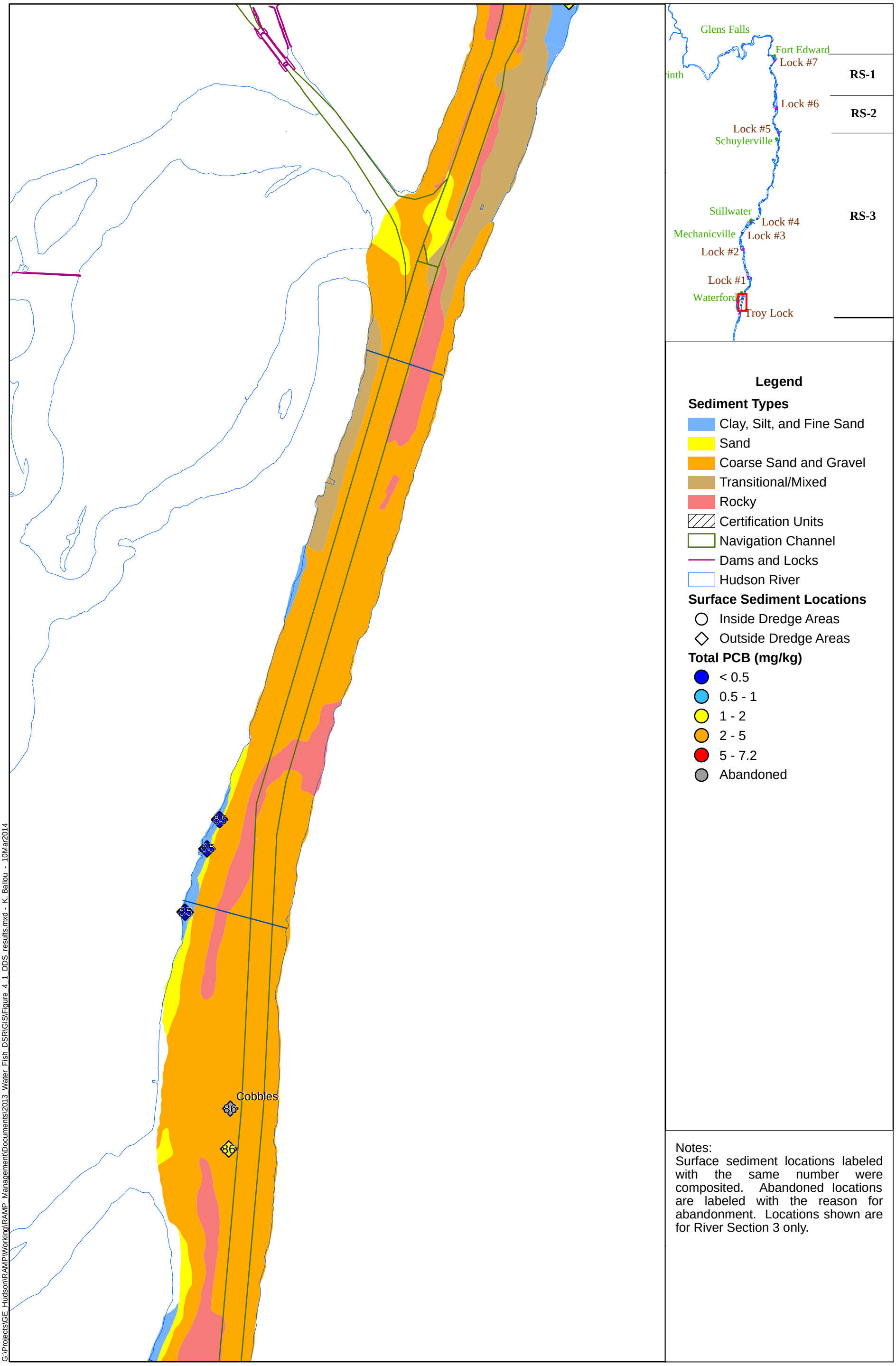

Figure 4-1o
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

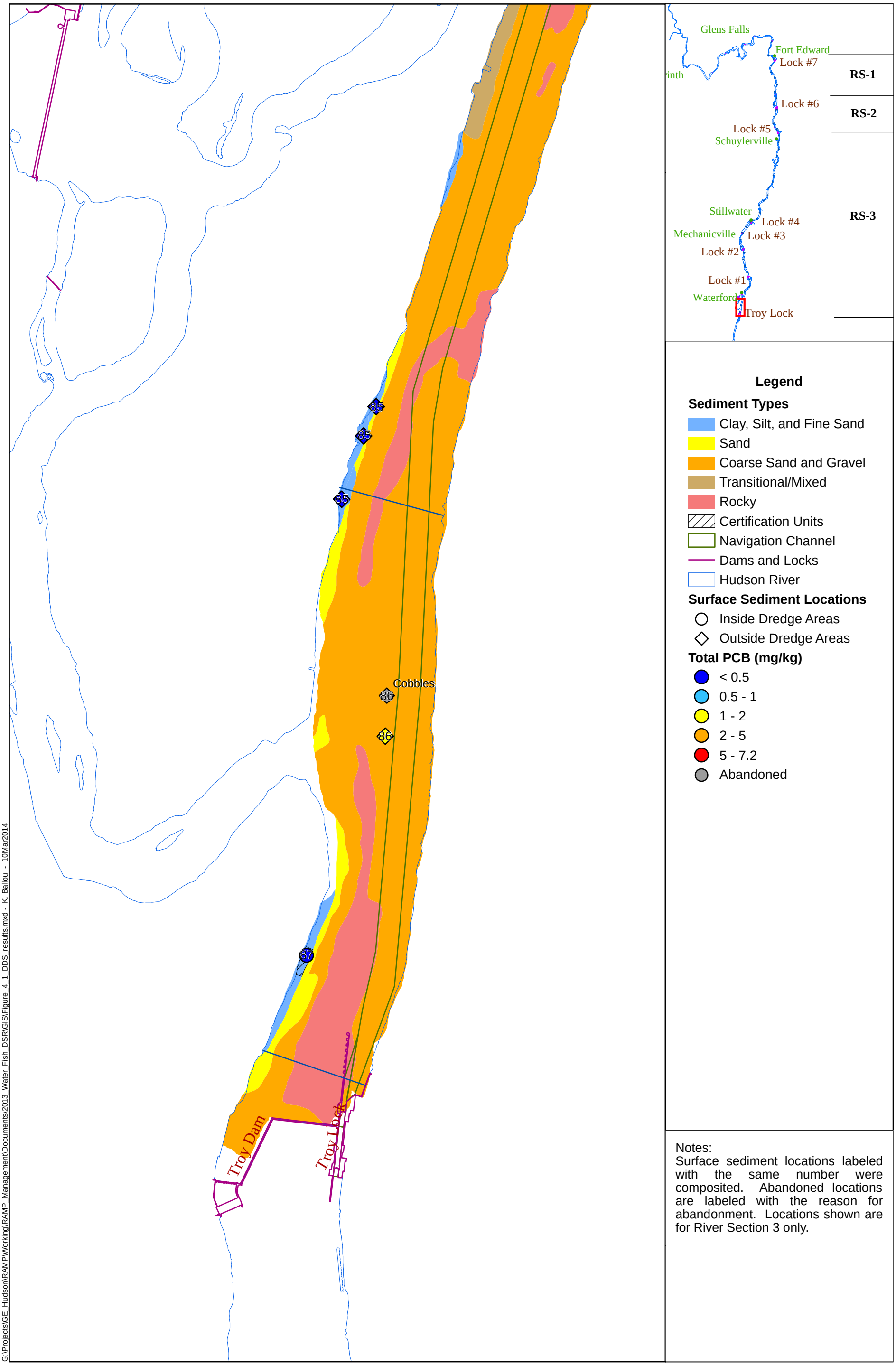

Figure 4-1p
Surface Sediment Total PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

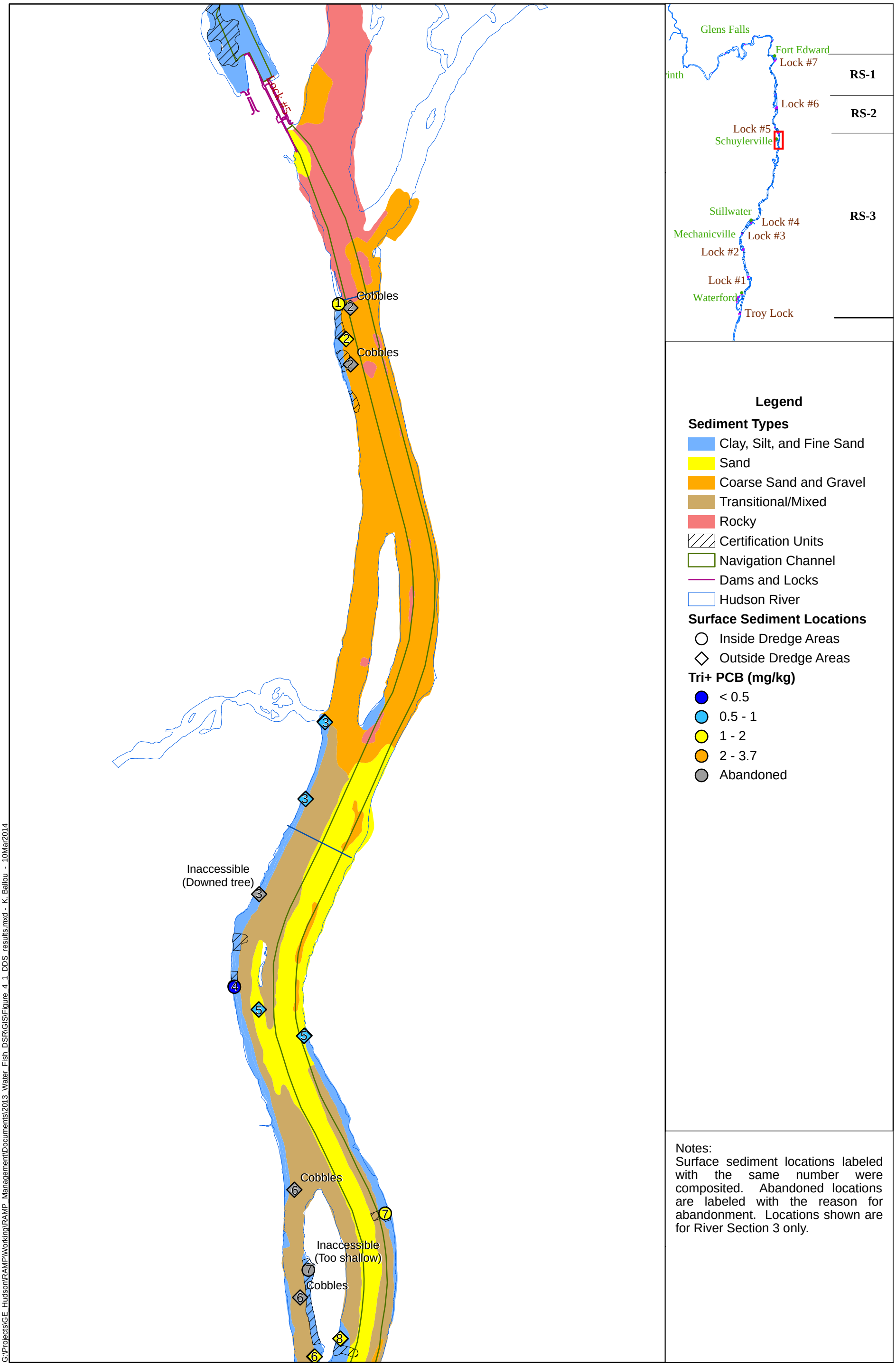

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Figure 4-2a
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

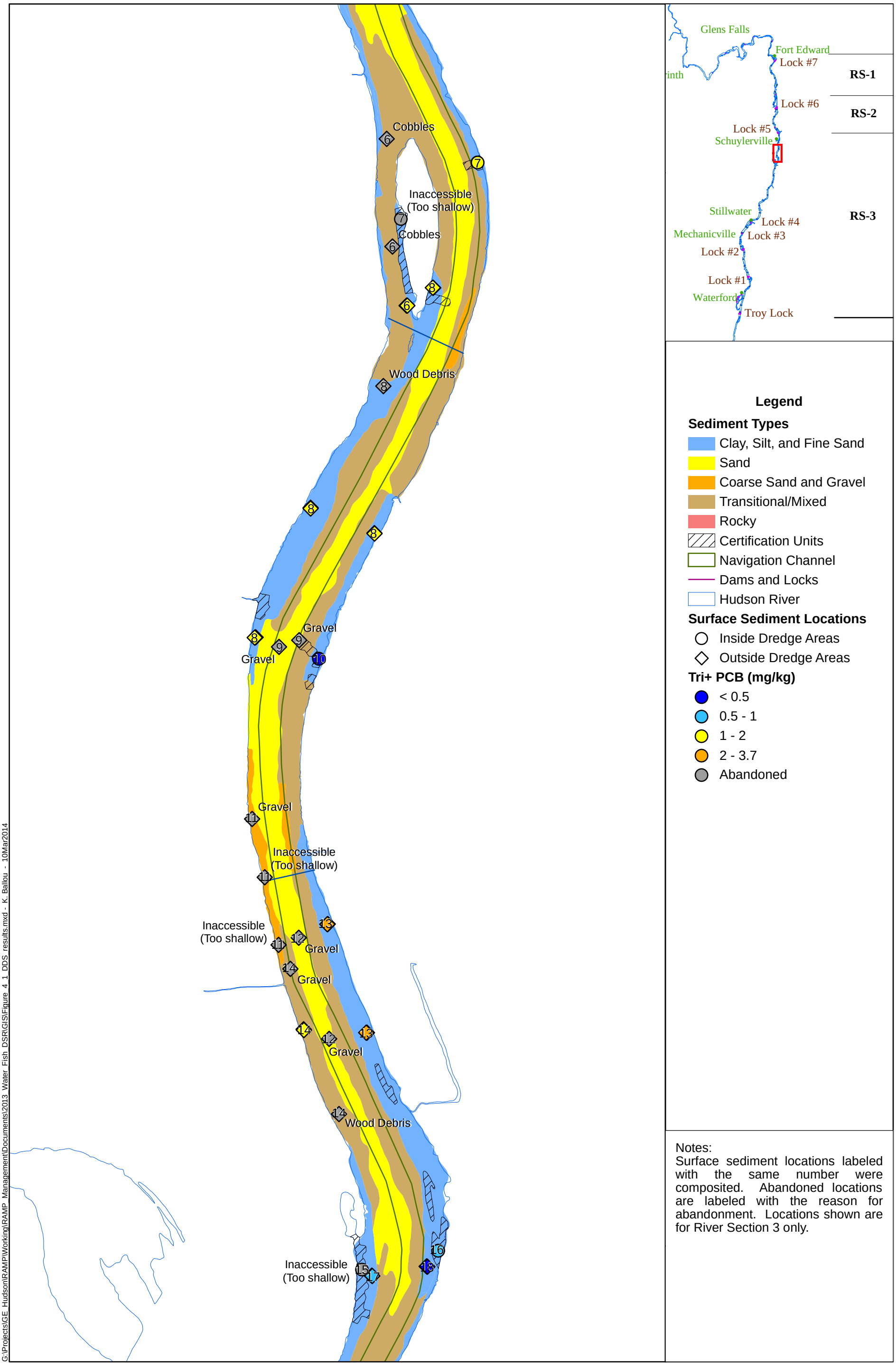


Figure 4-2b
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

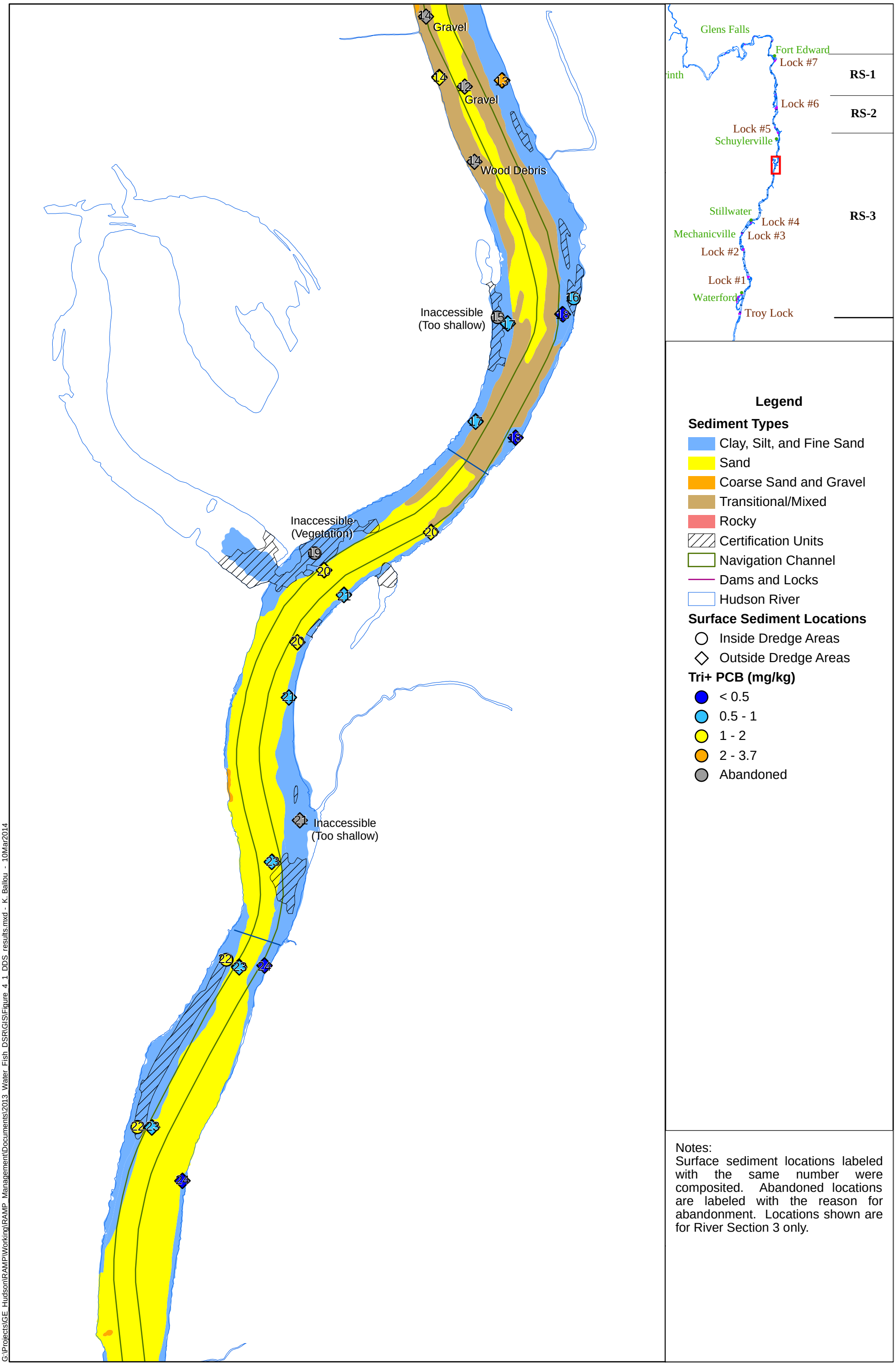


Figure 4-2c
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

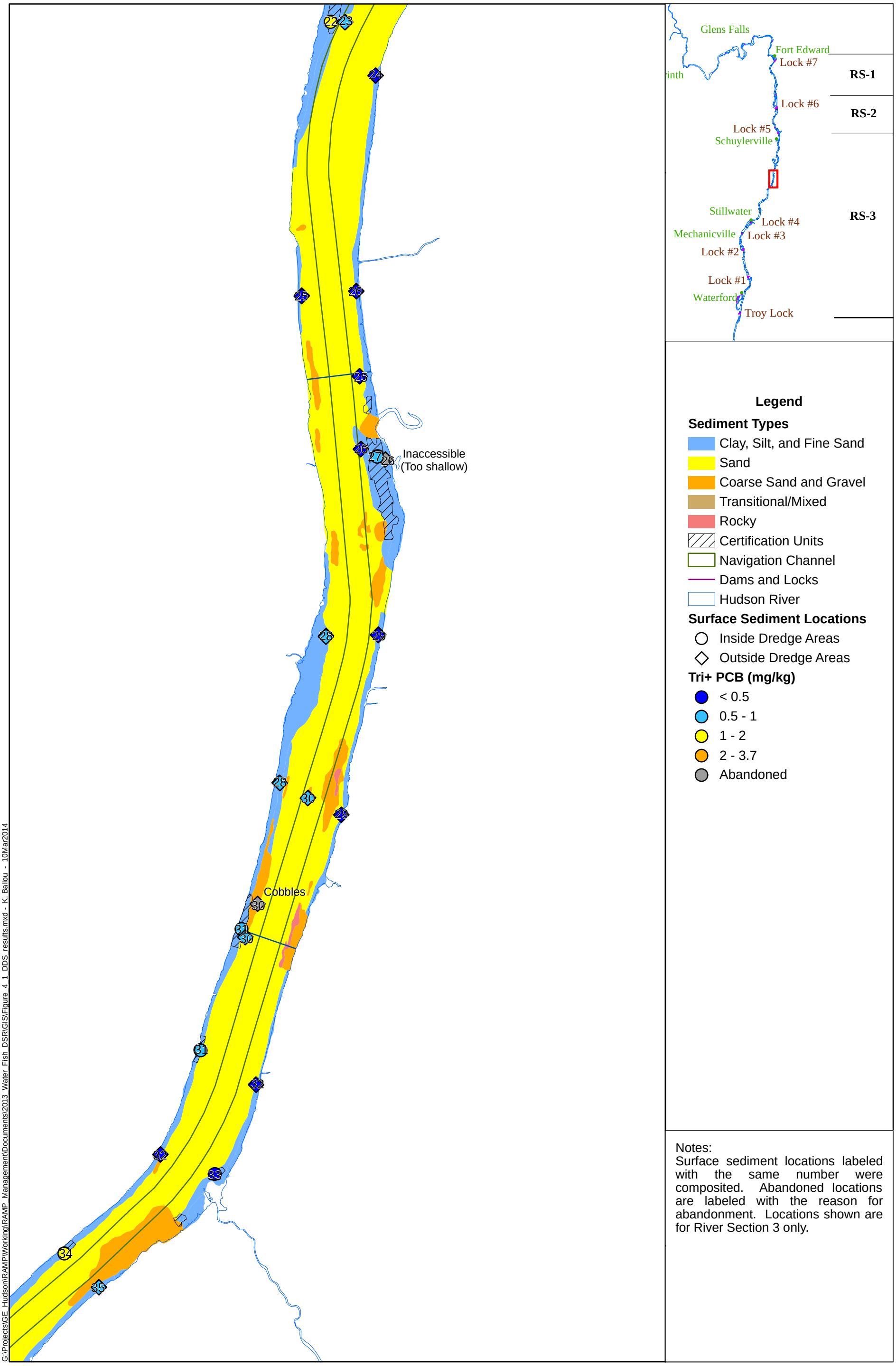


Figure 4-2d
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

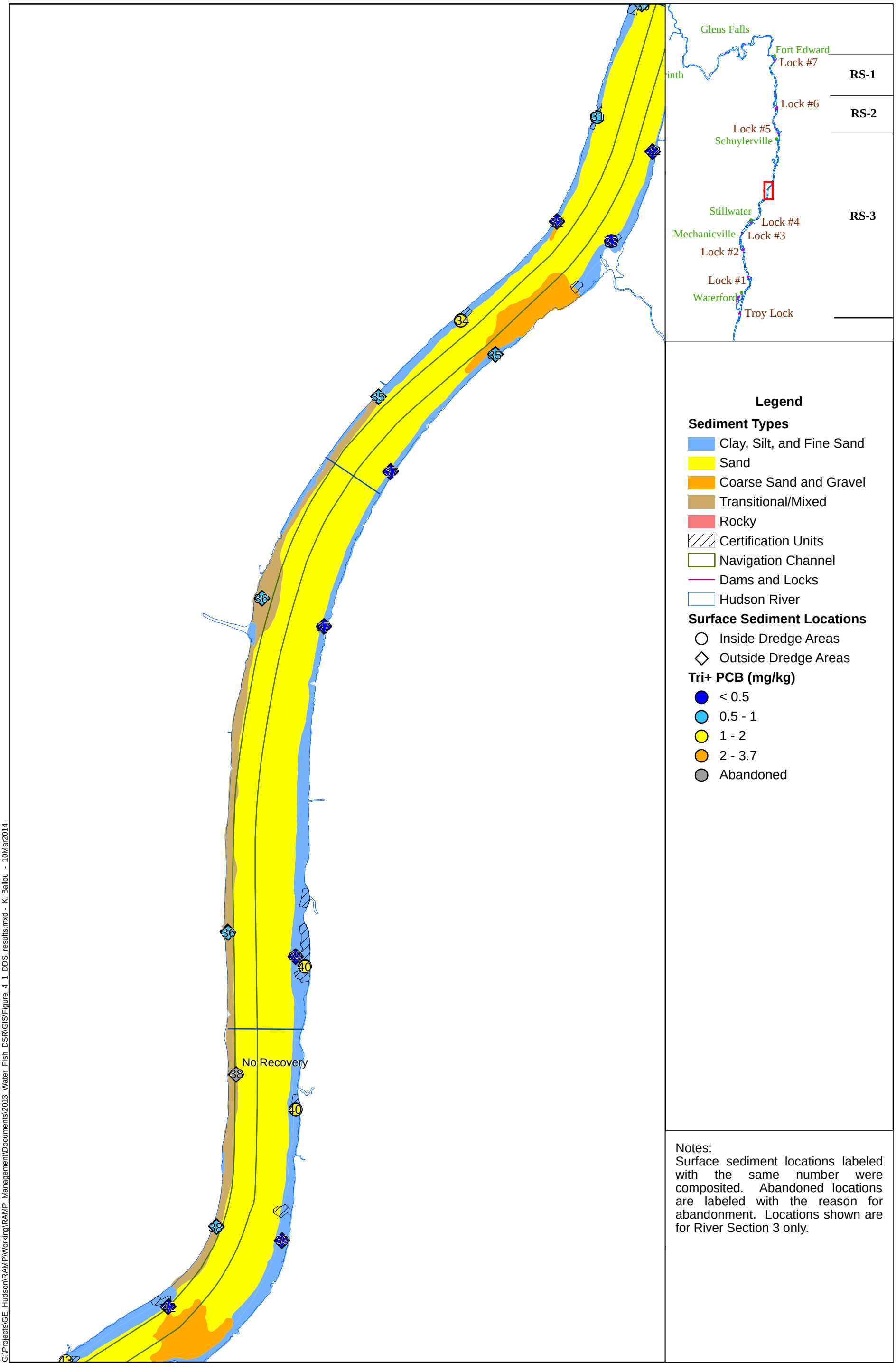


Figure 4-2e
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

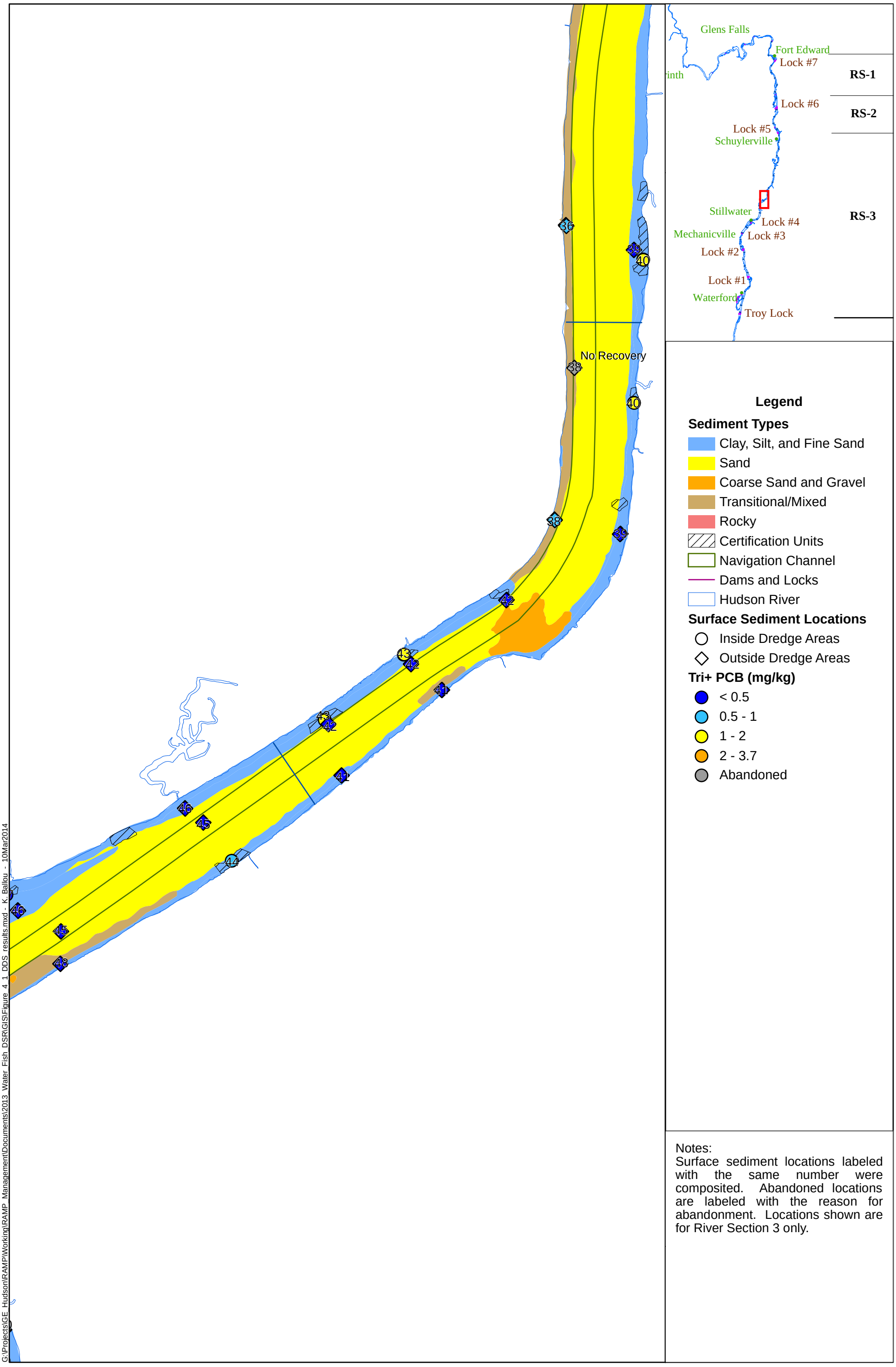


Figure 4-2f
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

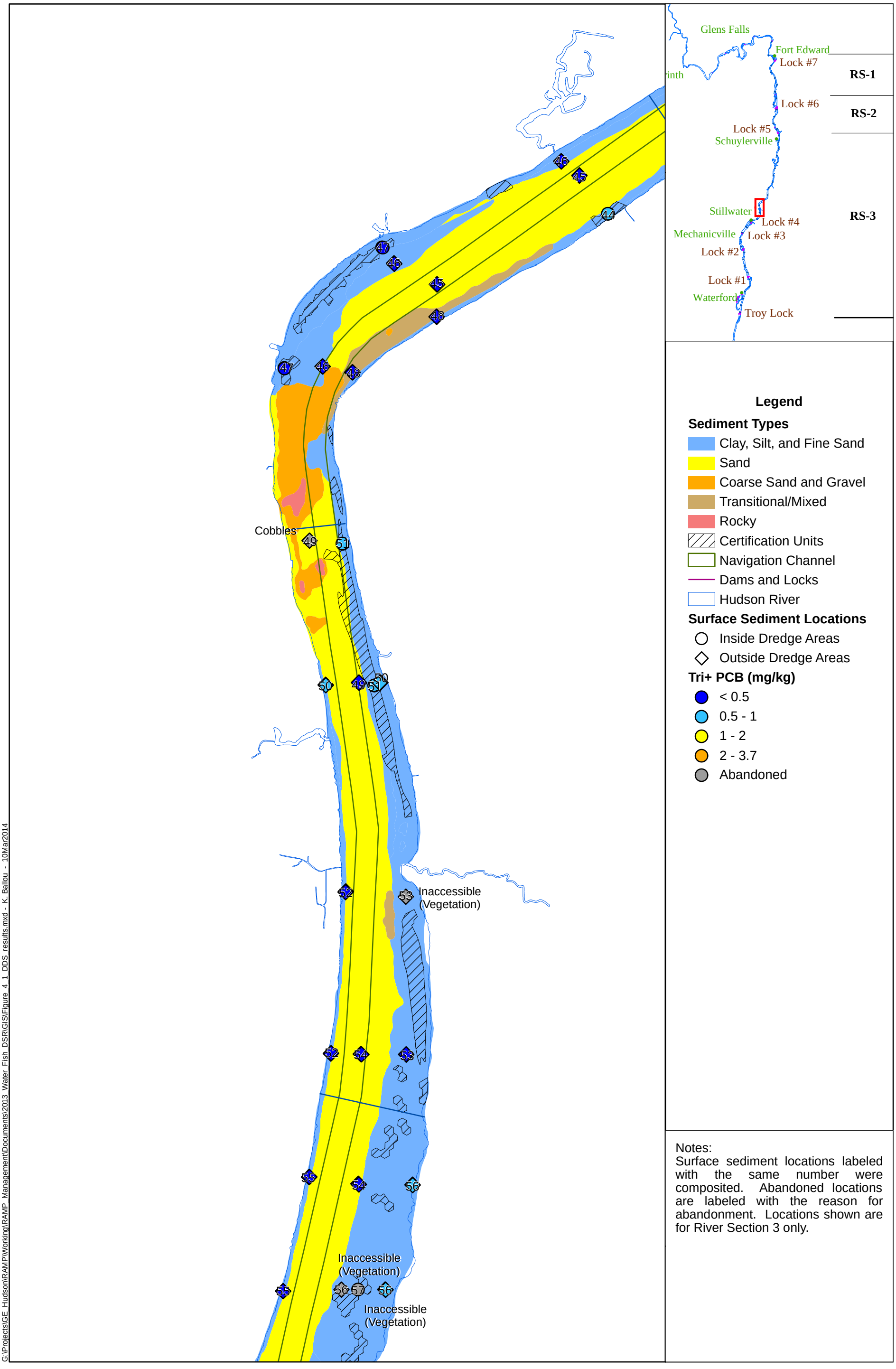


Figure 4-2g
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

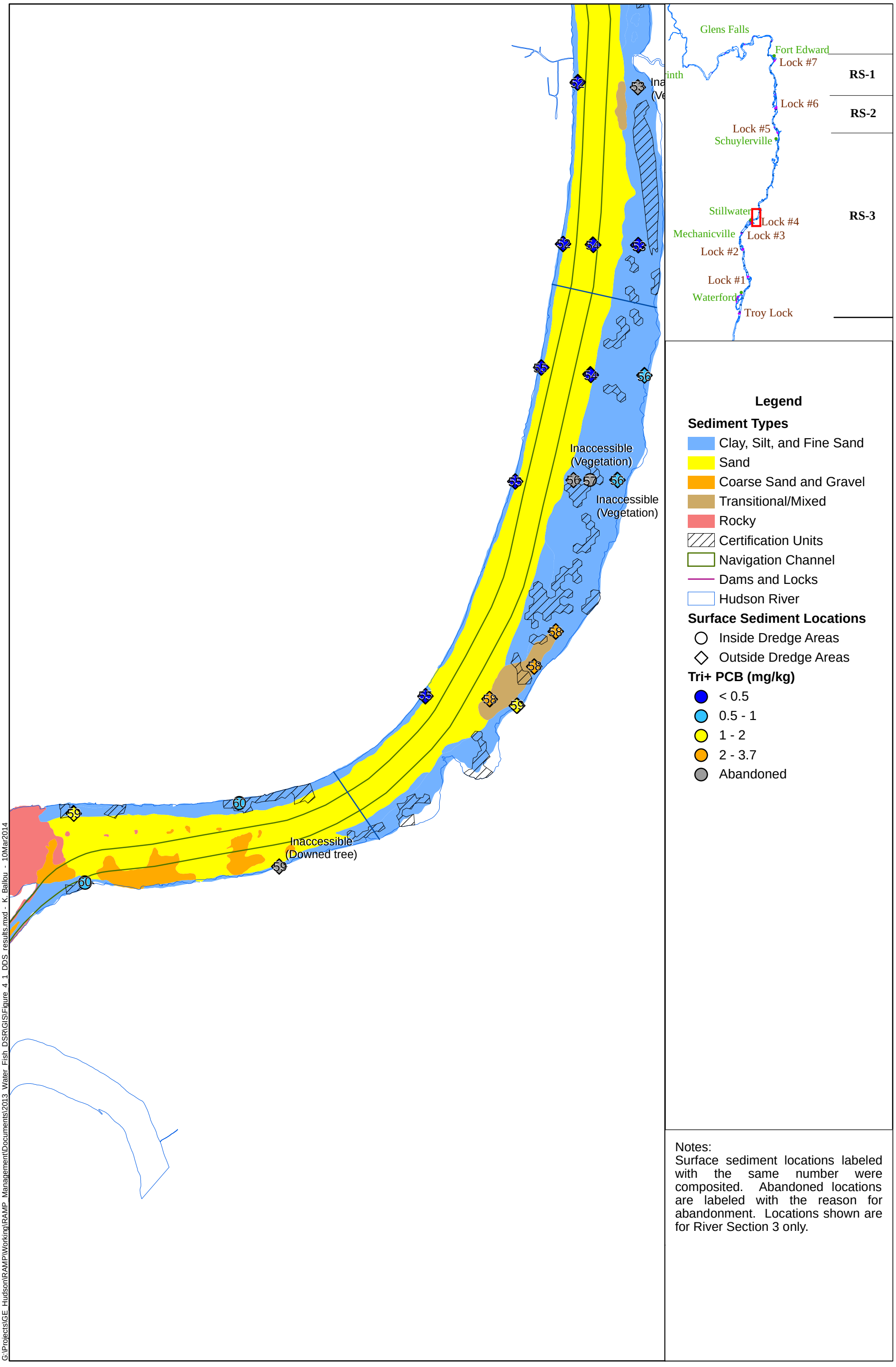


Figure 4-2h
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

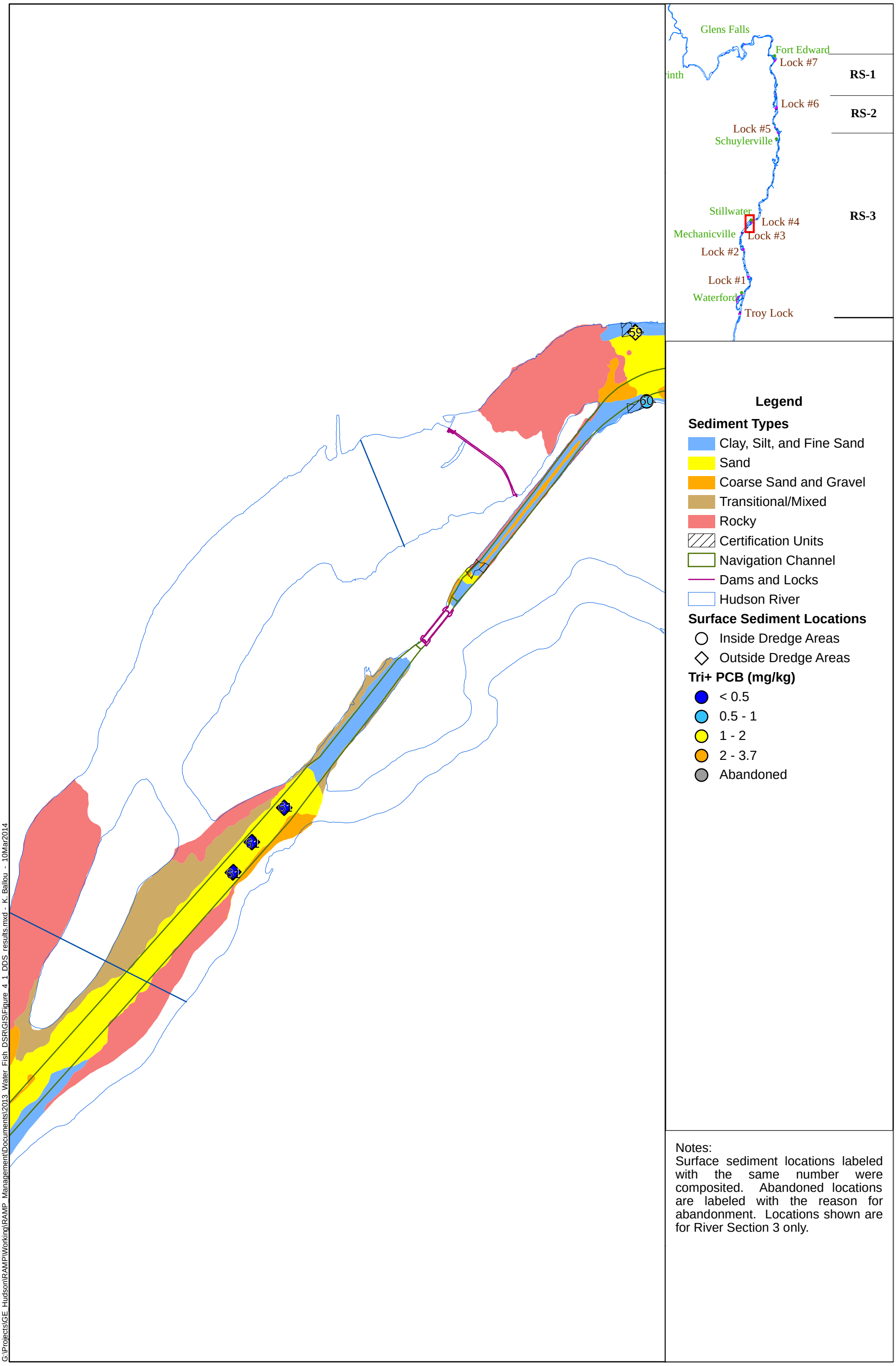
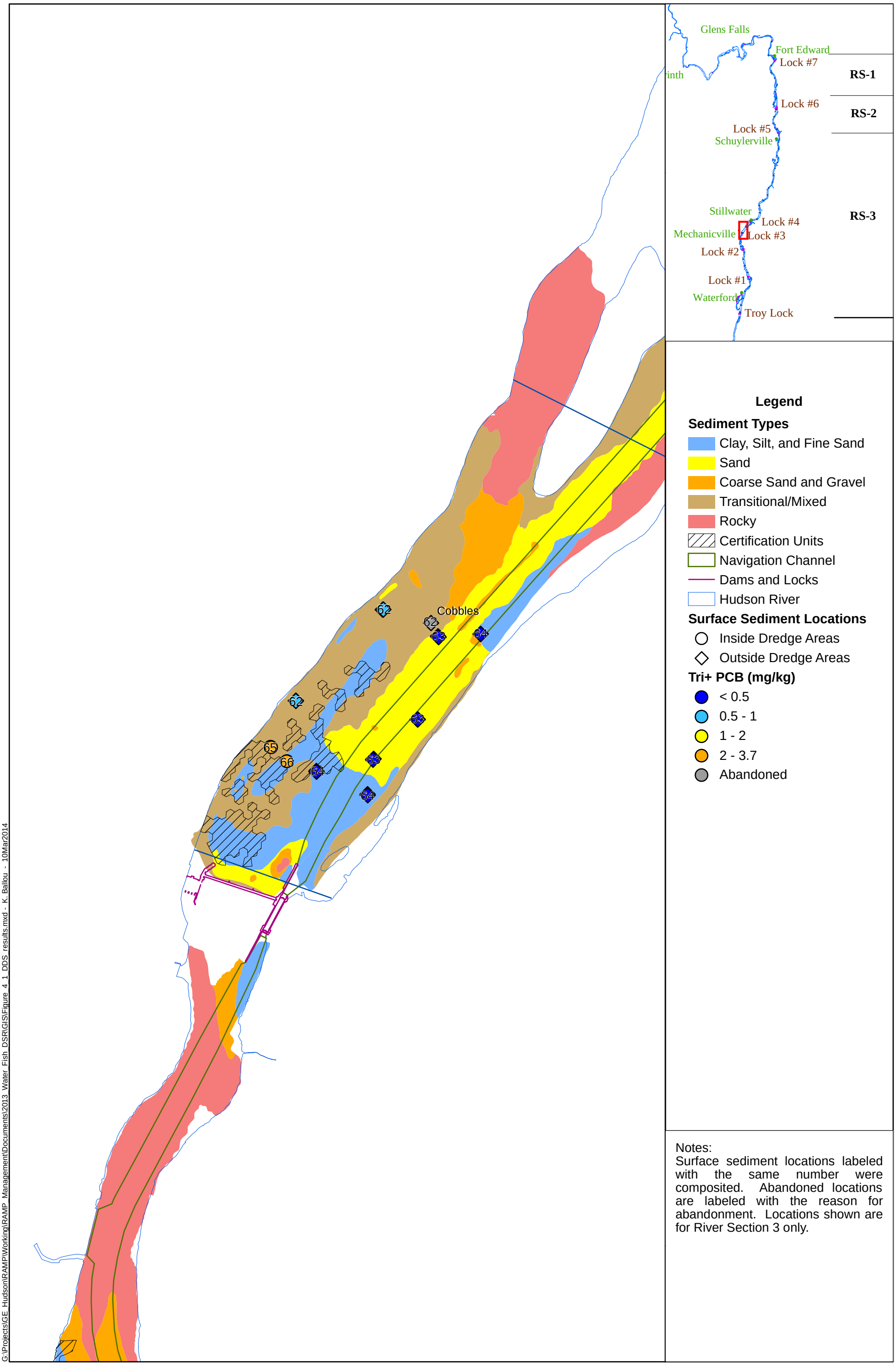


Figure 4-2i
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company



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Feet
0 500 1,000 2,000

Figure 4-2j
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

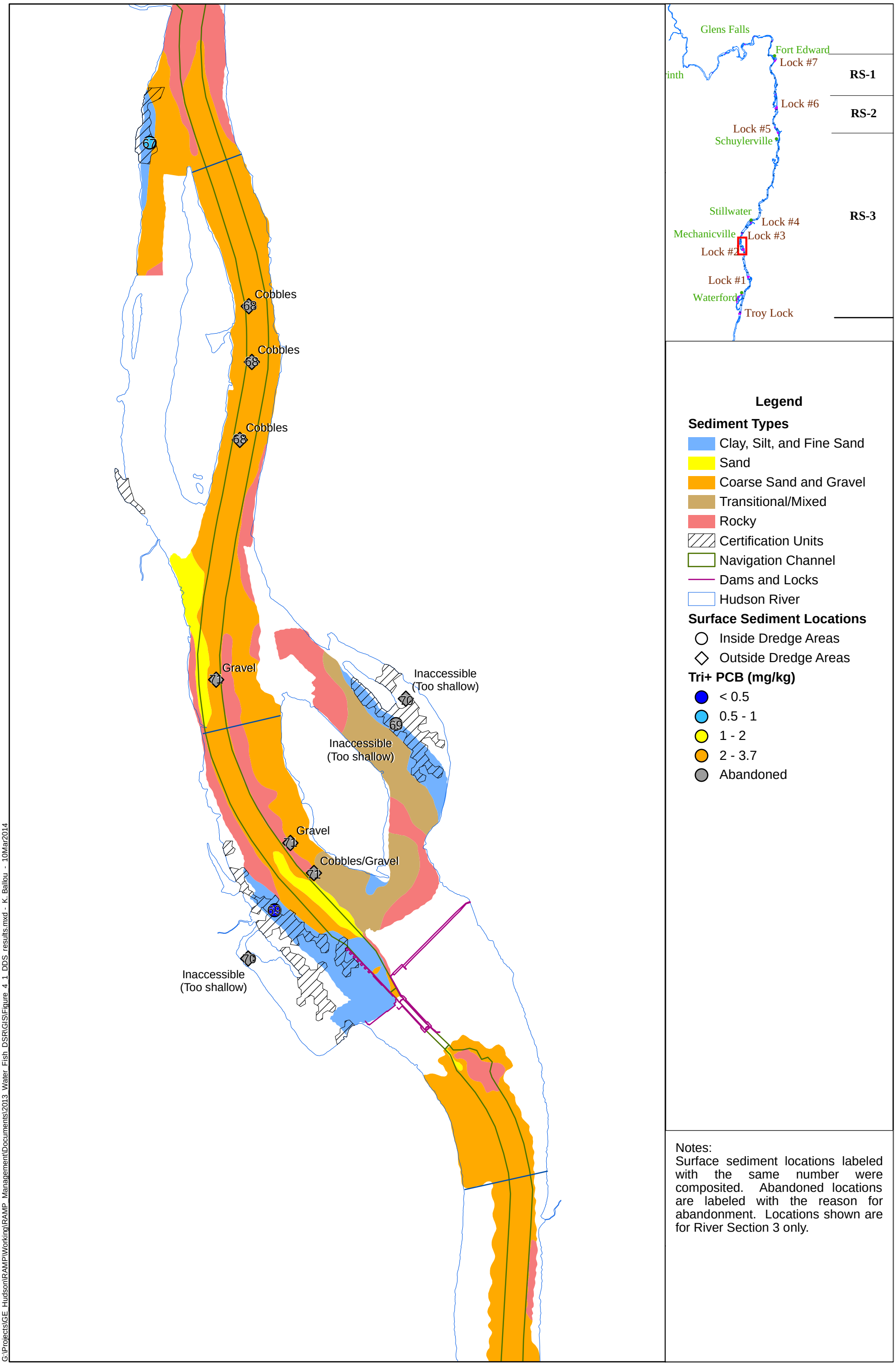

Figure 4-2k
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

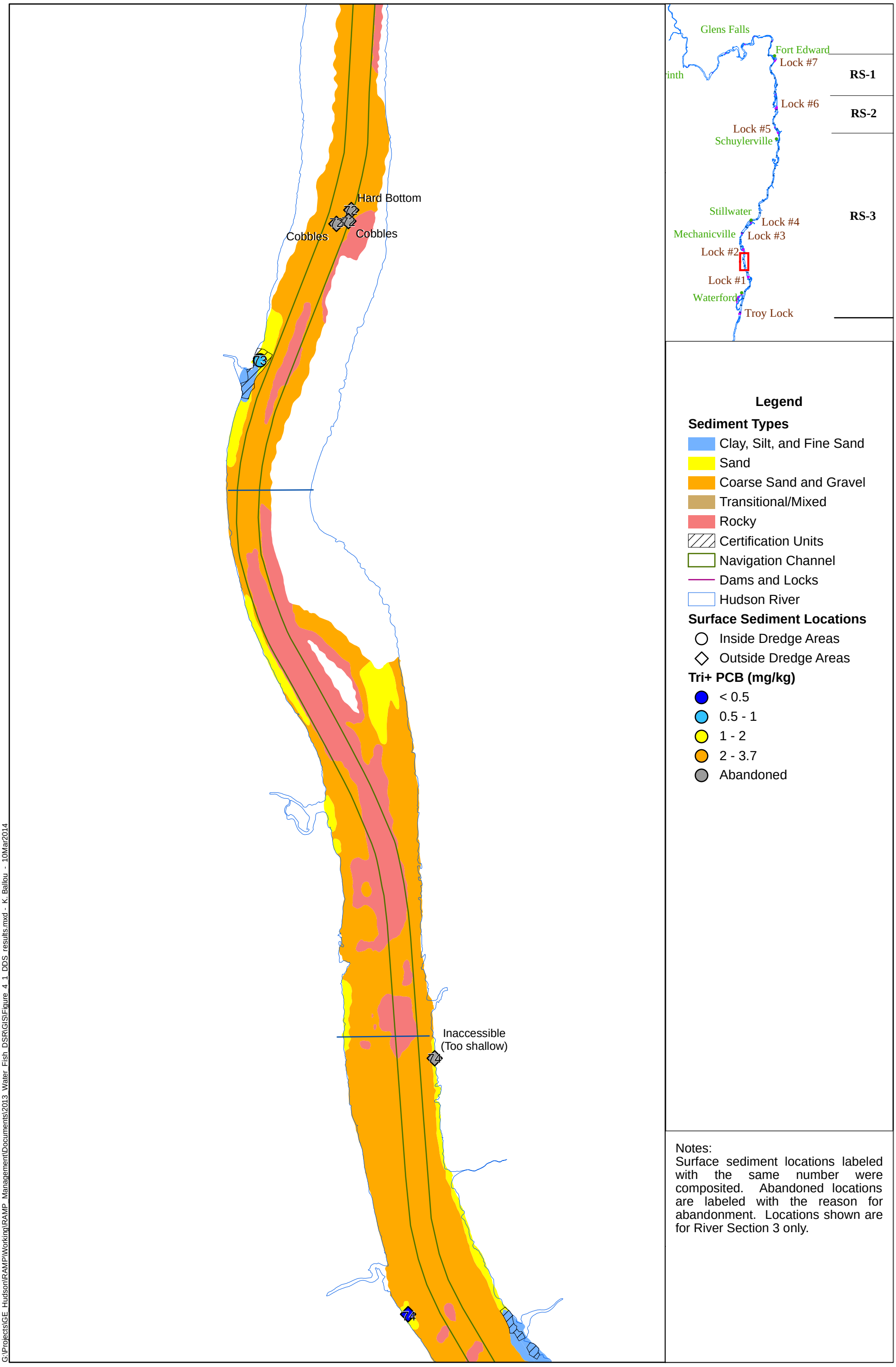

Figure 4-2l
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

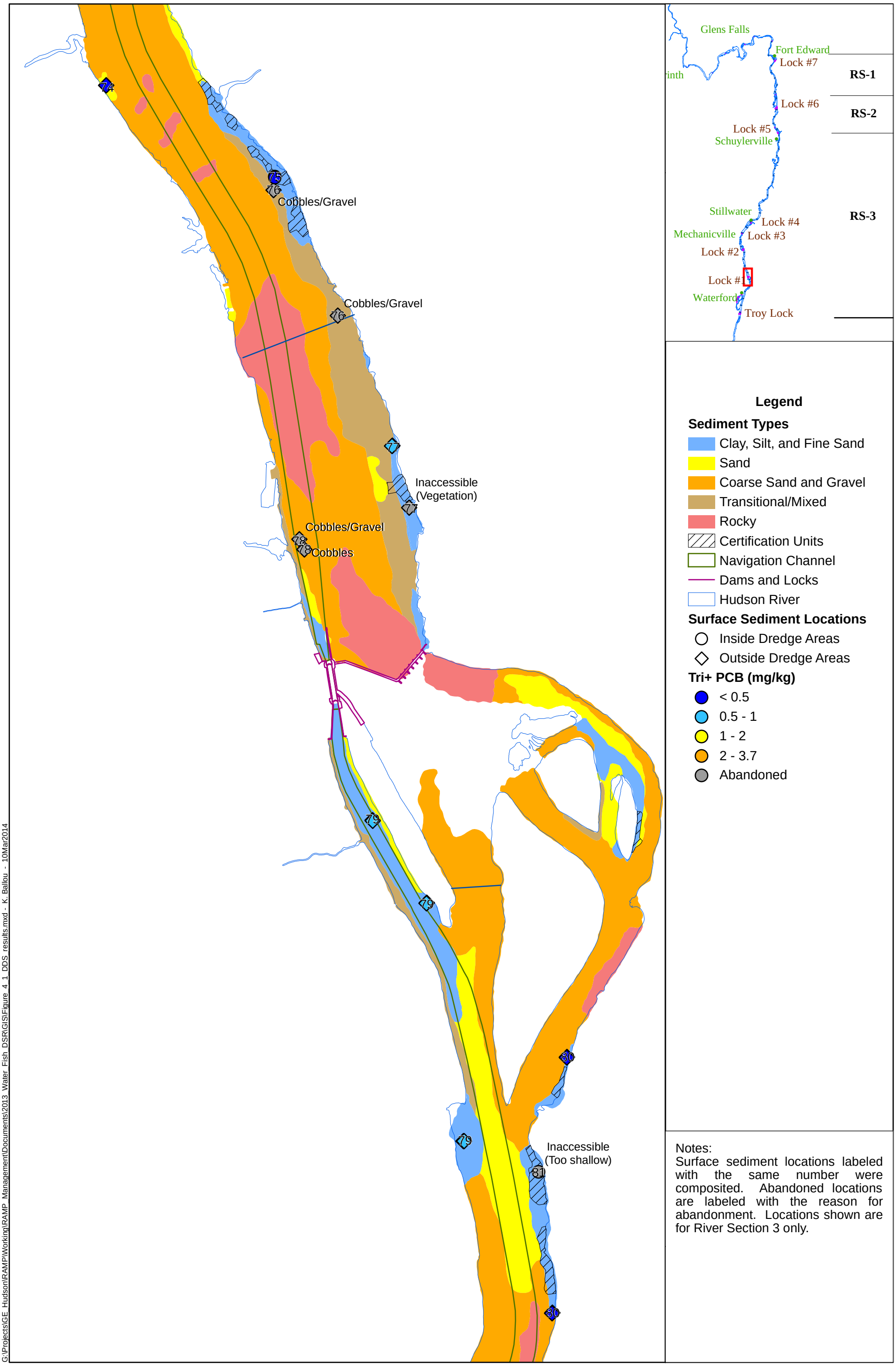

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Figure 4-2m
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

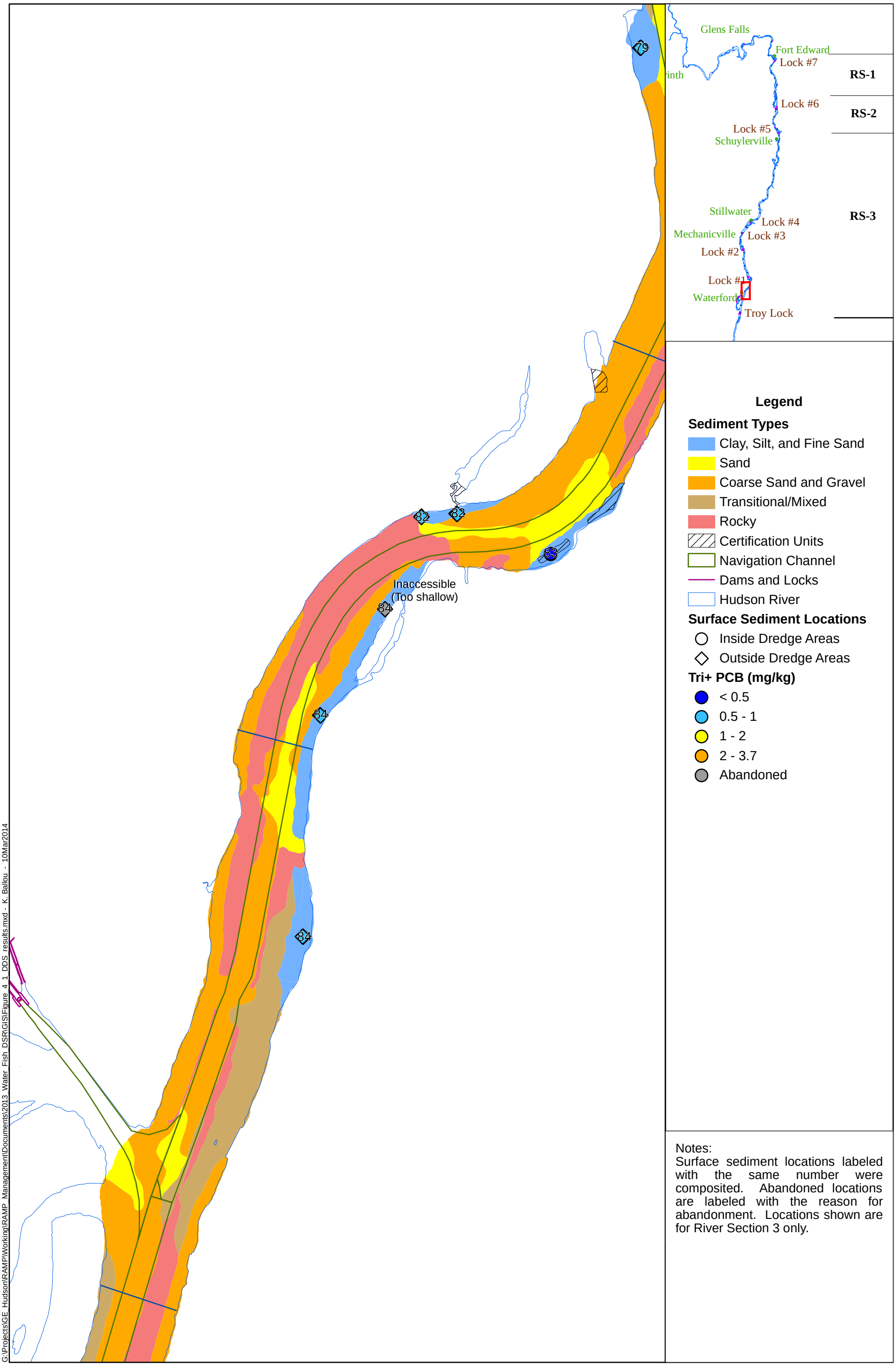


Figure 4-2n
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

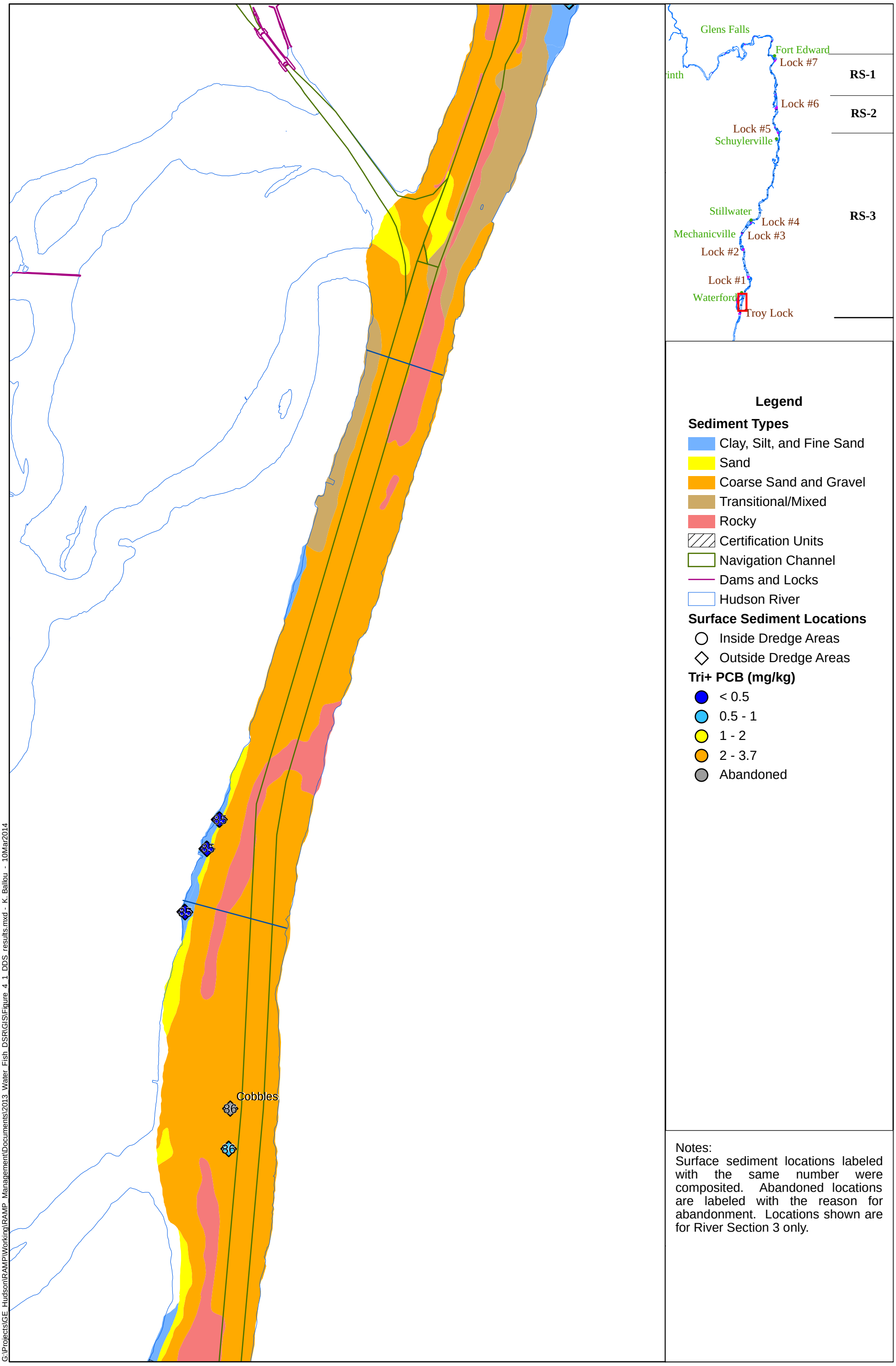
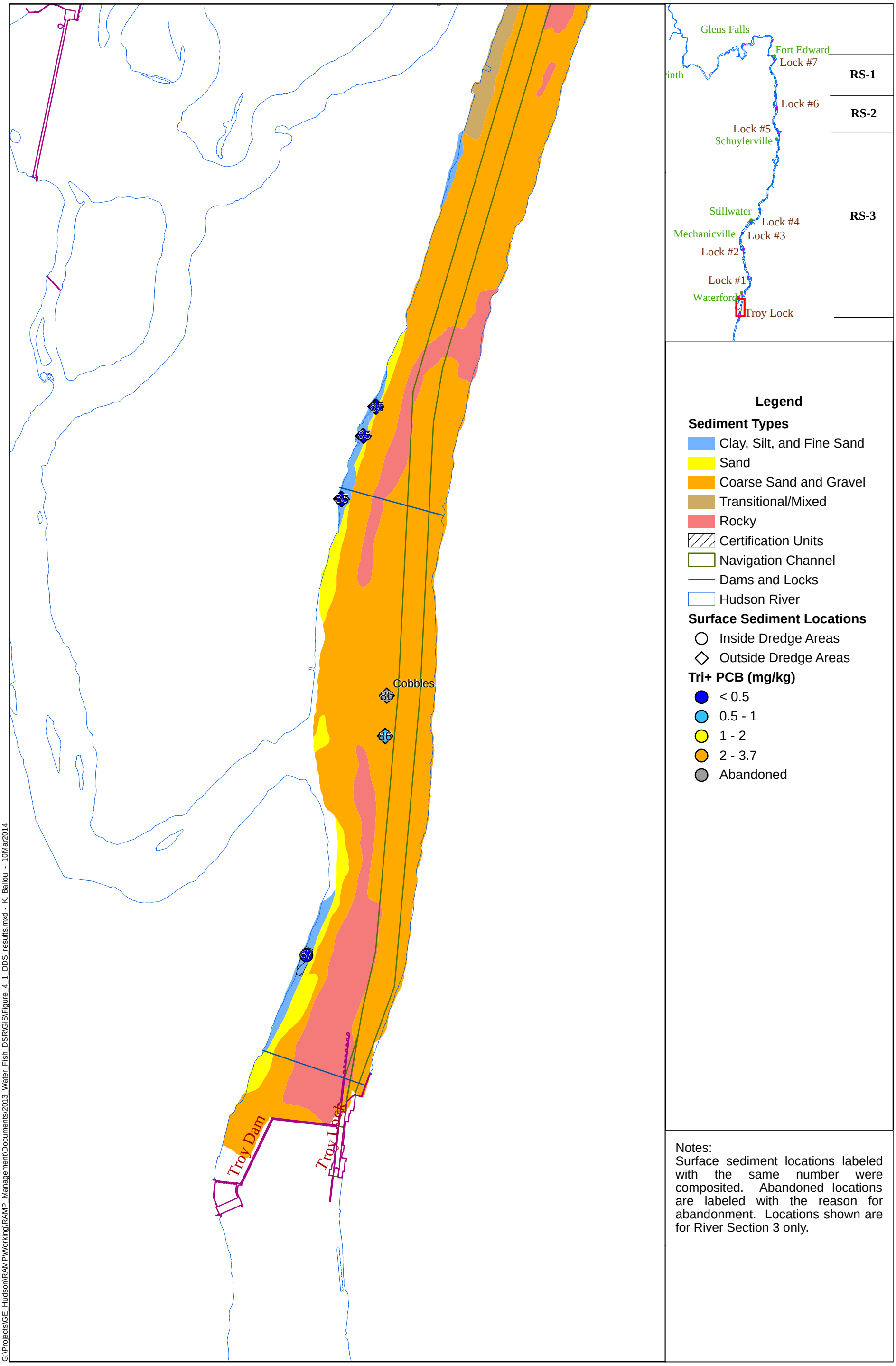


Figure 4-2o
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company



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Feet
0 500 1,000 2,000

Figure 4-2p
Surface Sediment Tri+ PCB Results
2013 Data Summary Report
Prepared for the General Electric Company

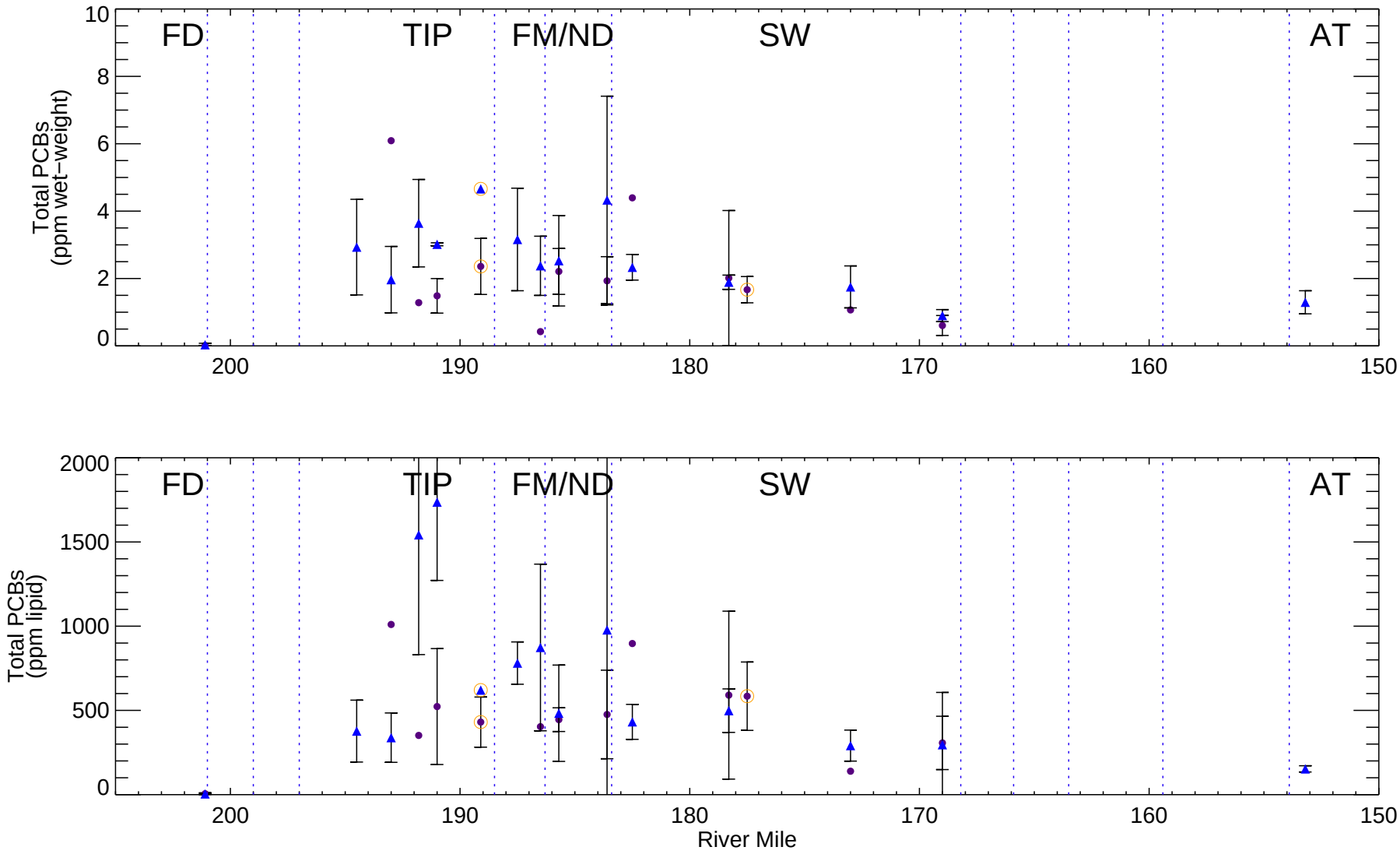

Figure 4−3
Spatial Patterns in PCB Concentrations in Black Bass
2013 Data Summary Report
Prepared for the General Electric Company

Data points represent arithmetic mean +/− 2 standard error of the mean. Year: 2013; prep: fillet
Blue dotted lines indicate approximate dam locations. Orange circles indicate historical sampling locations.

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JER − H:\Projects\GE_Hudson\RAMP\Working\RAMP_Fish\Analysis\Spatial\2013_DSR\hr_target_fish_spat_PCB_uhr_2013_by_spp.pro
Mon Mar 10 14:54:48 2014

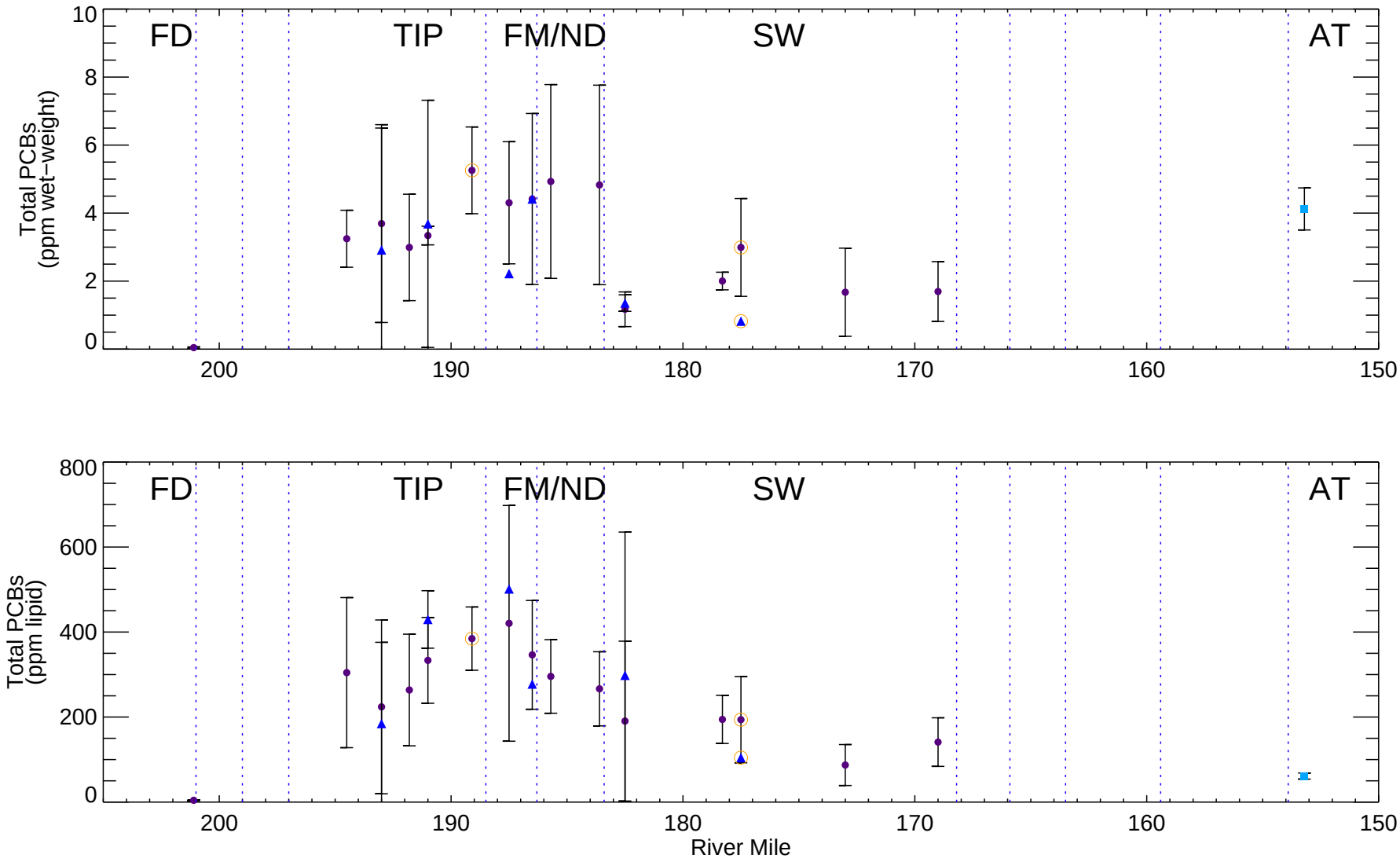

Figure 4−4
Spatial Patterns in PCB Concentrations in Ictalurids
2013 Data Summary Report
Prepared for the General Electric Company
Data points represent arithmetic mean +/− 2 standard error of the mean. Year: 2013; prep: fillet
Blue dotted lines indicate approximate dam locations. Orange circles indicate historical sampling locations.

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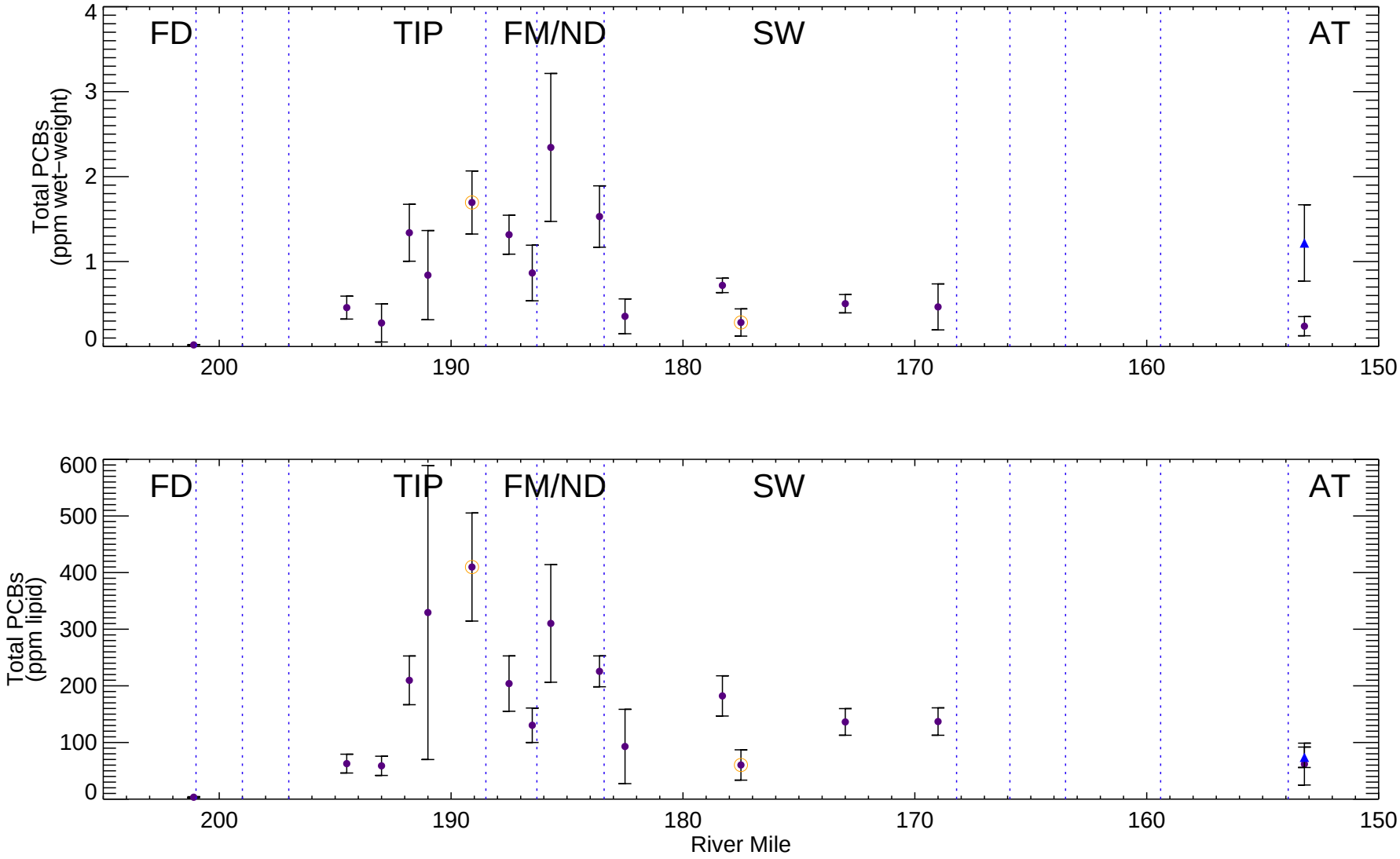
JER − H:\Projects\GE_Hudson\RAMP\Working\RAMP_Fish\Analysis\Spatial\2013_DSR\hr_target_fish_spat_PCB_uhr_2013_by_spp.pro
Mon Mar 10 14:54:49 2014



Yellow Perch
White Perch

Figure 4−5
Spatial Patterns in PCB Concentrations in Perch
2013 Data Summary Report
Prepared for the General Electric Company
Data points represent arithmetic mean +/− 2 standard error of the mean. Year: 2013; prep: fillet
Blue dotted lines indicate approximate dam locations. Orange circles indicate historical sampling locations.

ANCHOR QEA

JER − H:\Projects\GE_Hudson\RAMP\Working\RAMP_Fish\Analysis\Spatial\2013_DSR\hr_target_fish_spat_PCB_uhr_2013_by_spp.pro
Mon Mar 10 14:54:49 2014

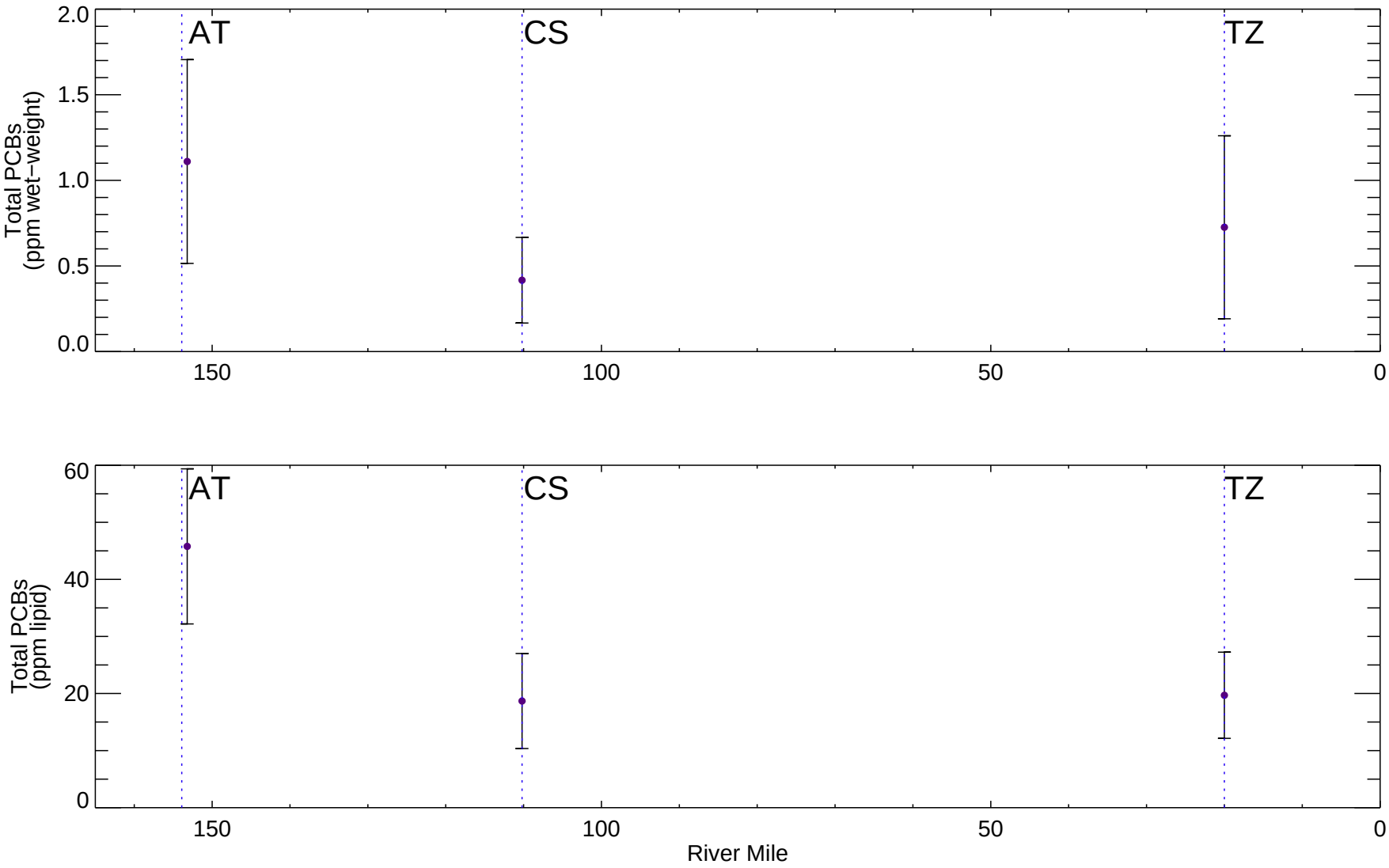


Figure 4−6

Spatial Patterns in PCB Concentrations in Striped Bass
2013 Data Summary Report
Prepared for the General Electric Company

Data points represent arithmetic mean +/− 2 standard error of the mean. Year: 2013; prep: fillet
Blue dotted lines indicate approximate dam locations. Orange circles indicate historical sampling locations.

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JER − H:\Projects\GE_Hudson\RAMP\Working\RAMP_Fish\Analysis\Spatial\2013_DSR\LHR_target_fish_STB_spat_PCB_2013_by_spp.pro
Mon Mar 10 14:57:29 2014

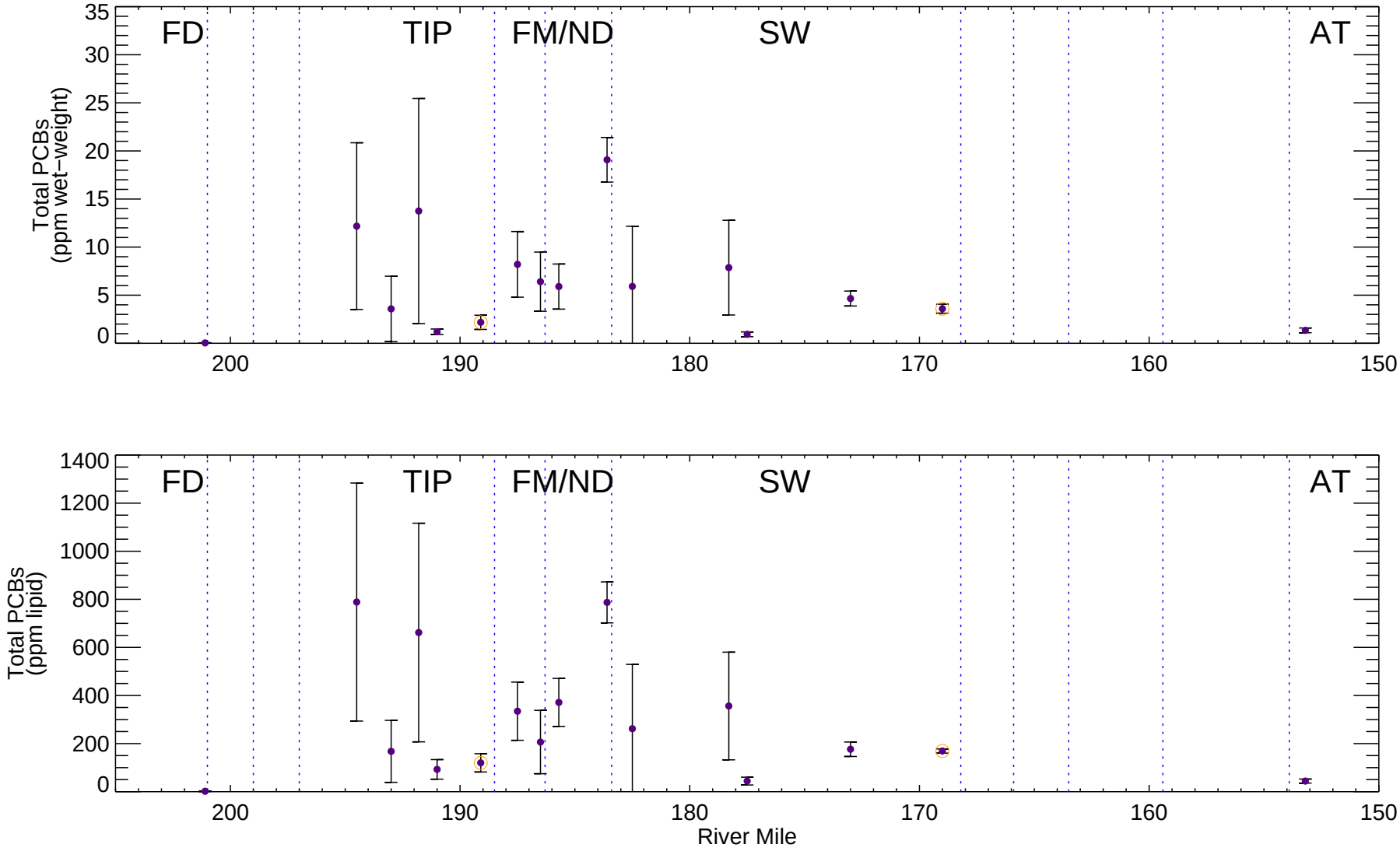

Figure 4−7

Spatial Patterns in PCB Concentrations in Pumpkinseed
2013 Data Summary Report
Prepared for the General Electric Company

Data points represent arithmetic mean +/− 2 standard error of the mean. Year: 2013; prep: whole body
Blue dotted lines indicate approximate dam locations. Orange circles indicate historical sampling locations.
Pumpkinseed are yearlings.

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JER − H:\Projects\GE_Hudson\RAMP\Working\RAMP_Fish\Analysis\Spatial\2013_DSR\hr_target_fish_spat_PCB_uhr_2013_by_spp.pro
Mon Mar 10 14:54:49 2014

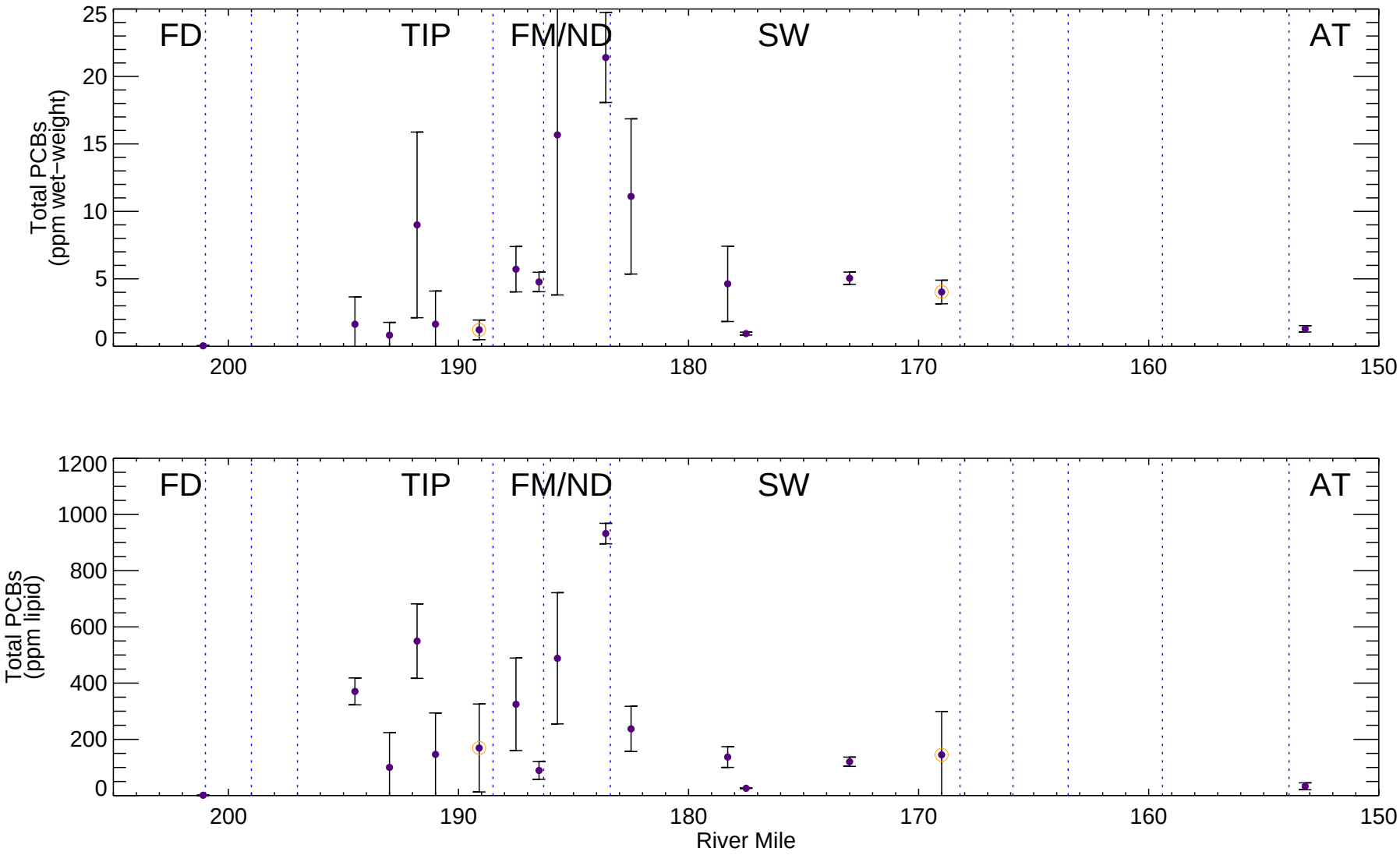

Figure 4−8

Spatial Patterns in PCB Concentrations in Forage Fish
2013 Data Summary Report
Prepared for the General Electric Company

Data points represent arithmetic mean +/− 2 standard error of the mean. Year: 2013; prep: whole−body composite
Blue dotted lines indicate approximate dam locations. Orange circles indicate historical sampling locations.

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JER − H:\Projects\GE_Hudson\RAMP\Working\RAMP_Fish\Analysis\Spatial\2013_DSR\hr_target_fish_spat_PCB_uhr_2013_by_spp.pro
Mon Mar 10 14:54:49 2014

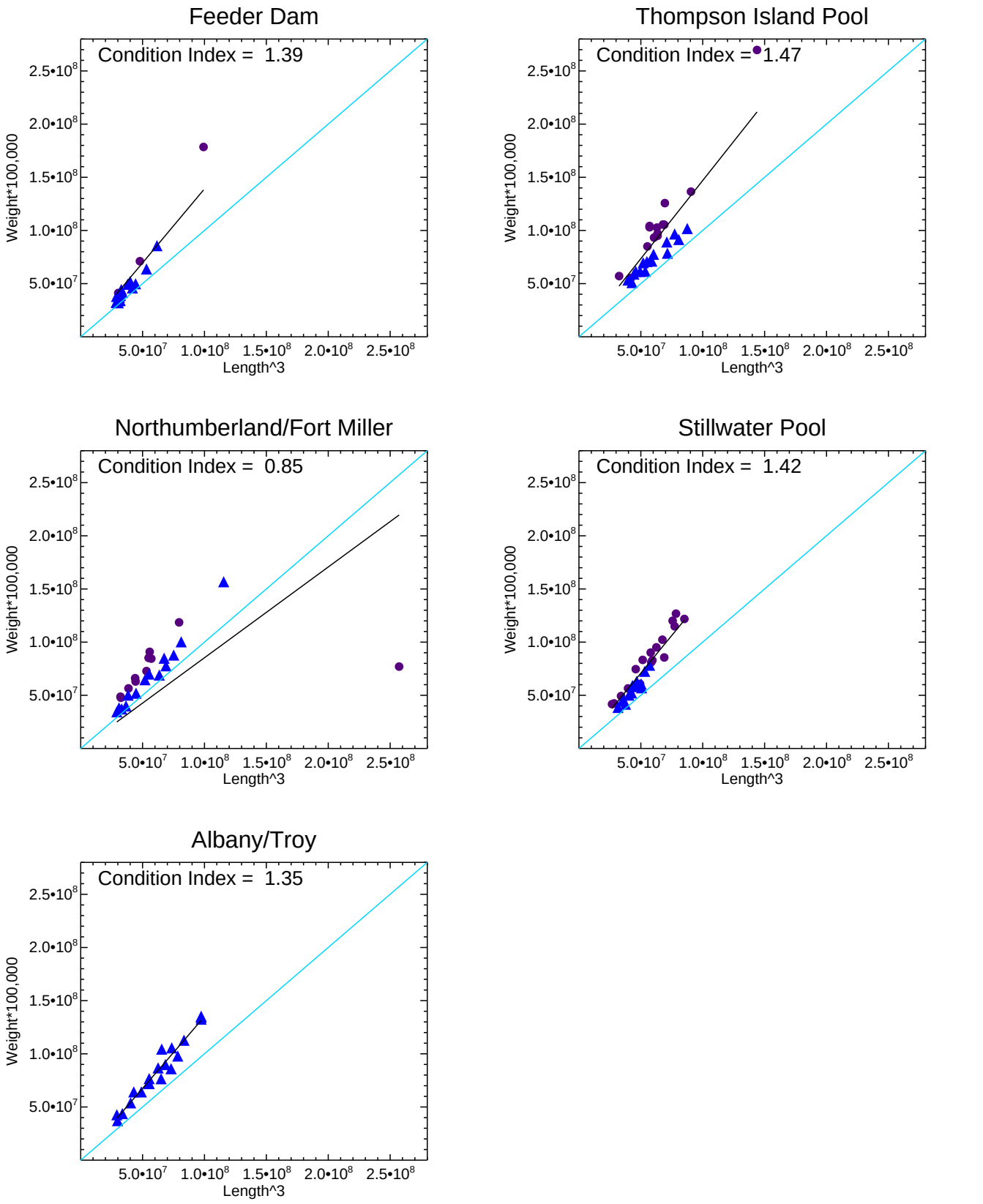


Figure 4−9
Condition Index of Black Bass for 2013 Sampling Events
2013 Data Summary Report
Prepared for the General Electric Company
Light blue line represents the 1:1 line.

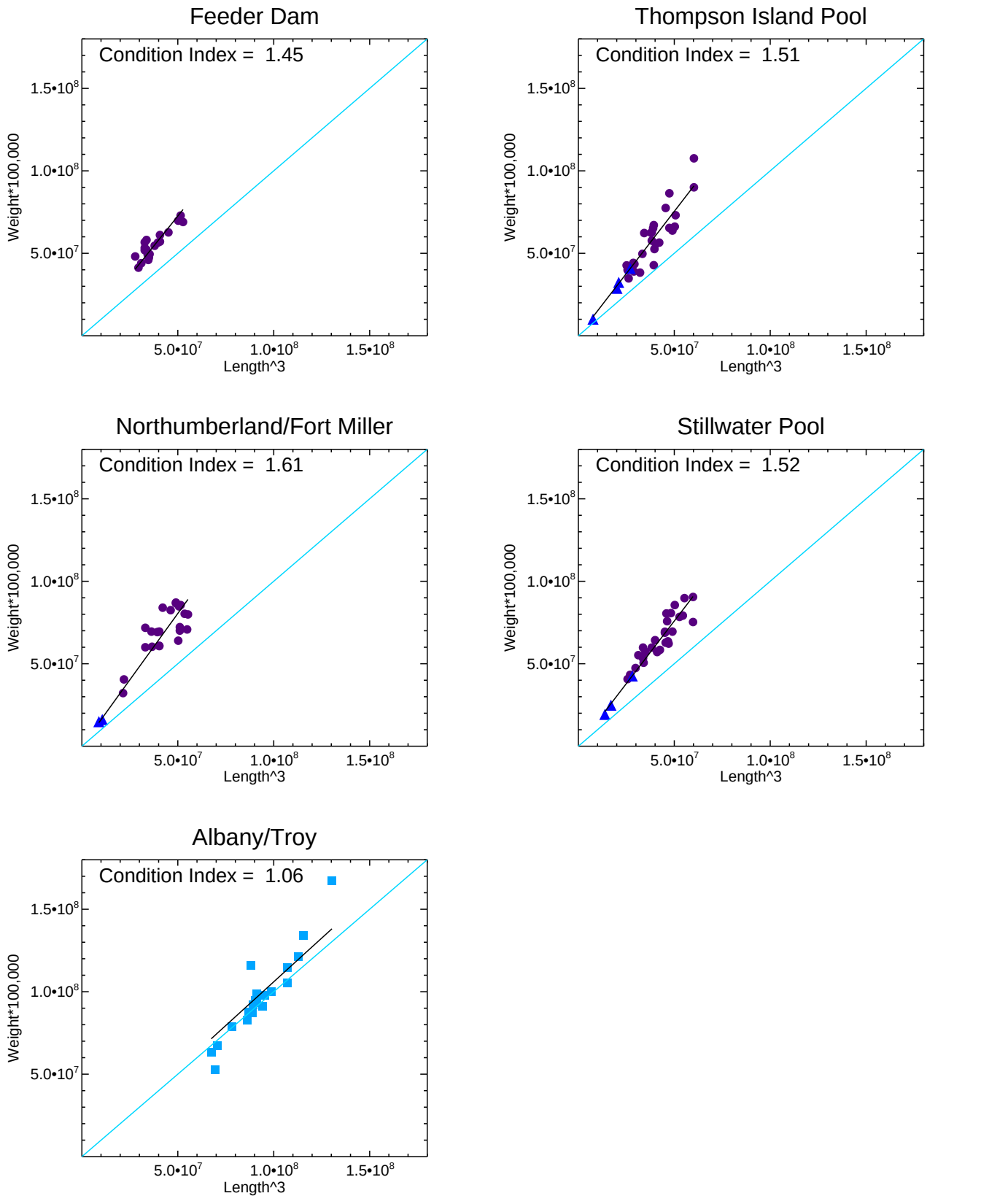


Figure 4−10
Condition Index of Ictalurids for 2013 Sampling Events
2013 Data Summary Report
Prepared for the General Electric Company
Light blue line represents the 1:1 line.

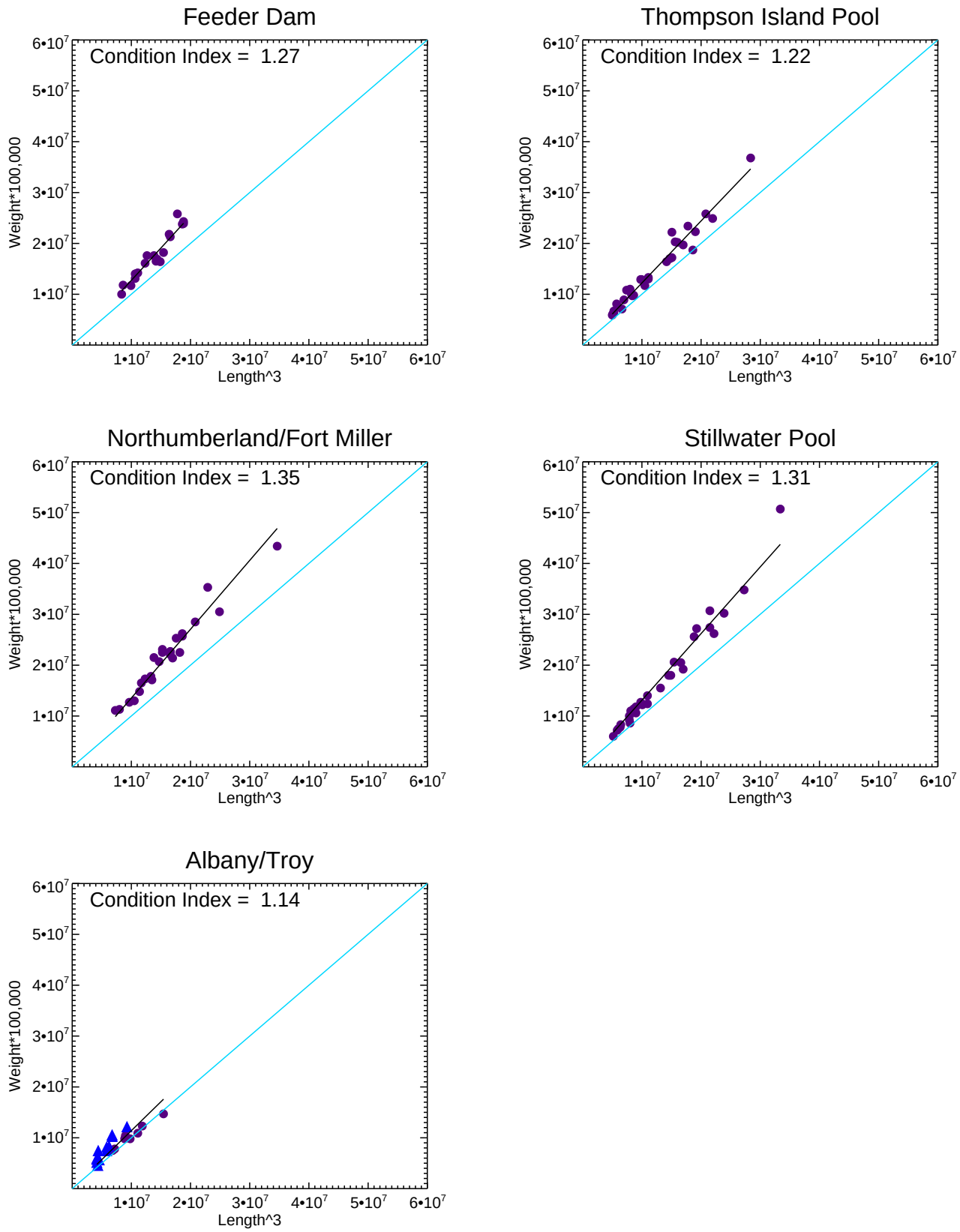
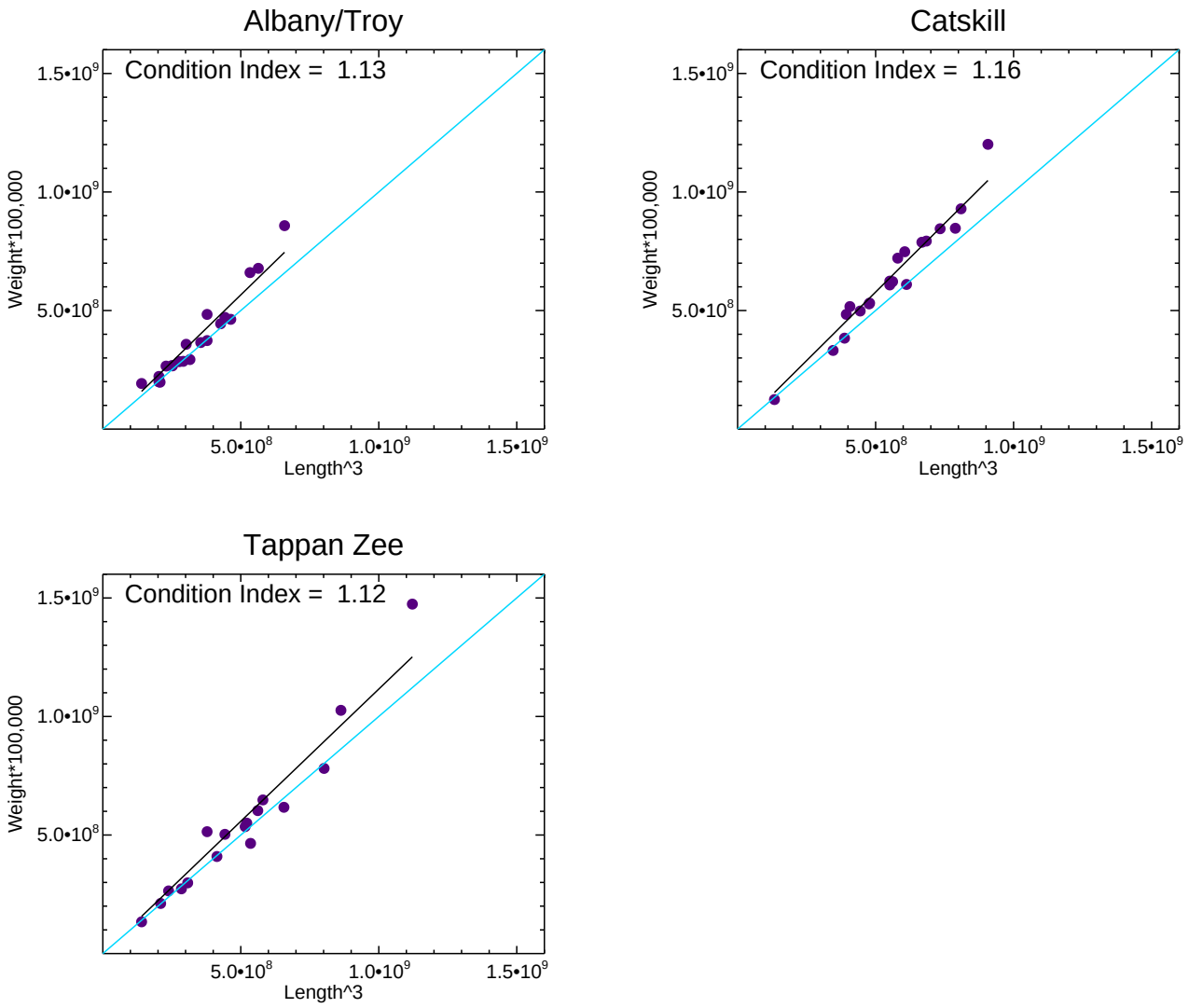


Figure 4−11
Condition Index of Perch for 2013 Sampling Events
2013 Data Summary Report
Prepared for the General Electric Company
Light blue line represents the 1:1 line.



Striped Bass

Figure 4−12
Condition Index of Striped Bass for 2013 Sampling Events
2013 Data Summary Report
Prepared for the General Electric Company
Light blue line represents the 1:1 line.

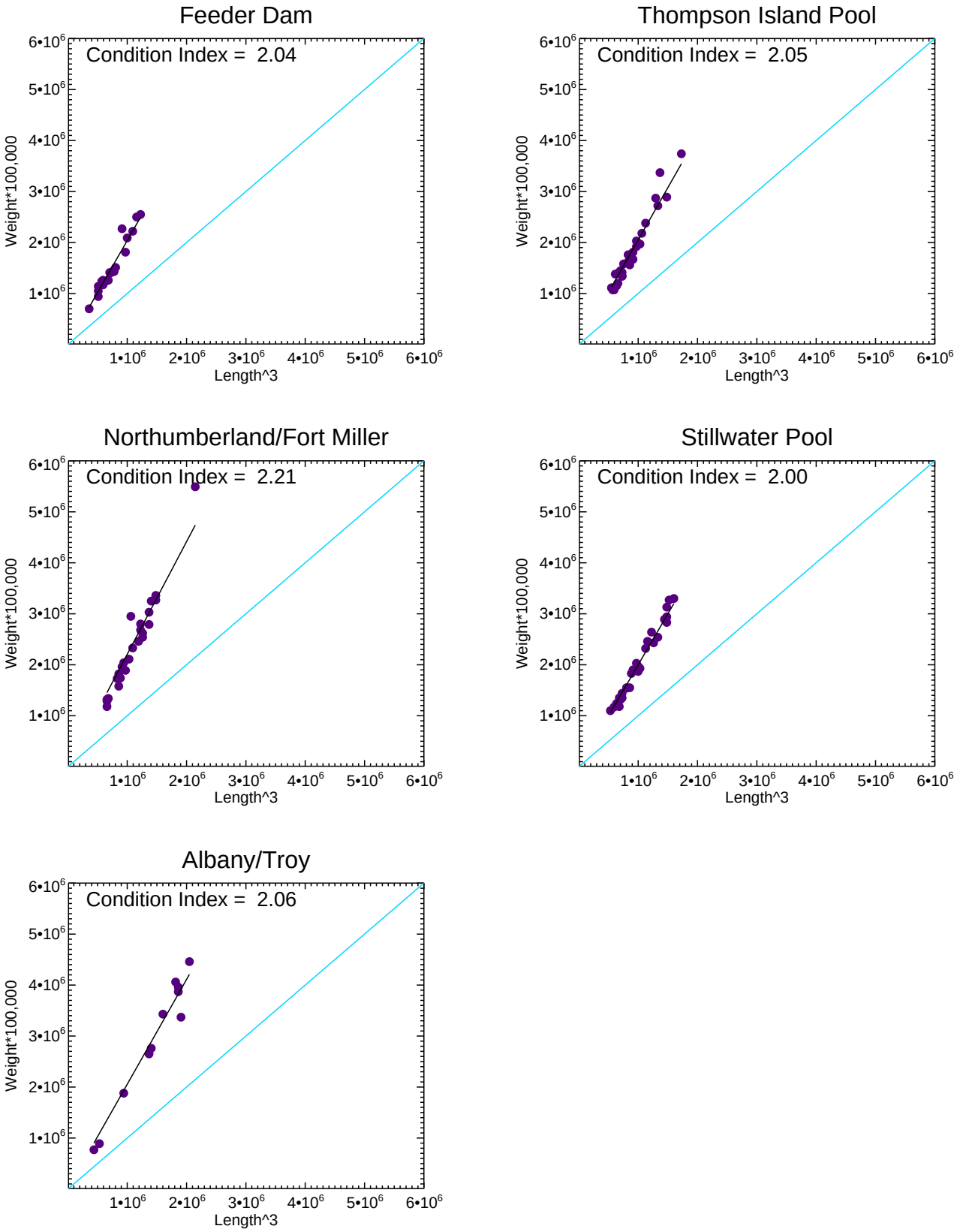


Figure 4−13
Condition Index of Pumpkinseed for 2013 Sampling Events
2013 Data Summary Report
Prepared for the General Electric Company
Light blue line represents the 1:1 line.

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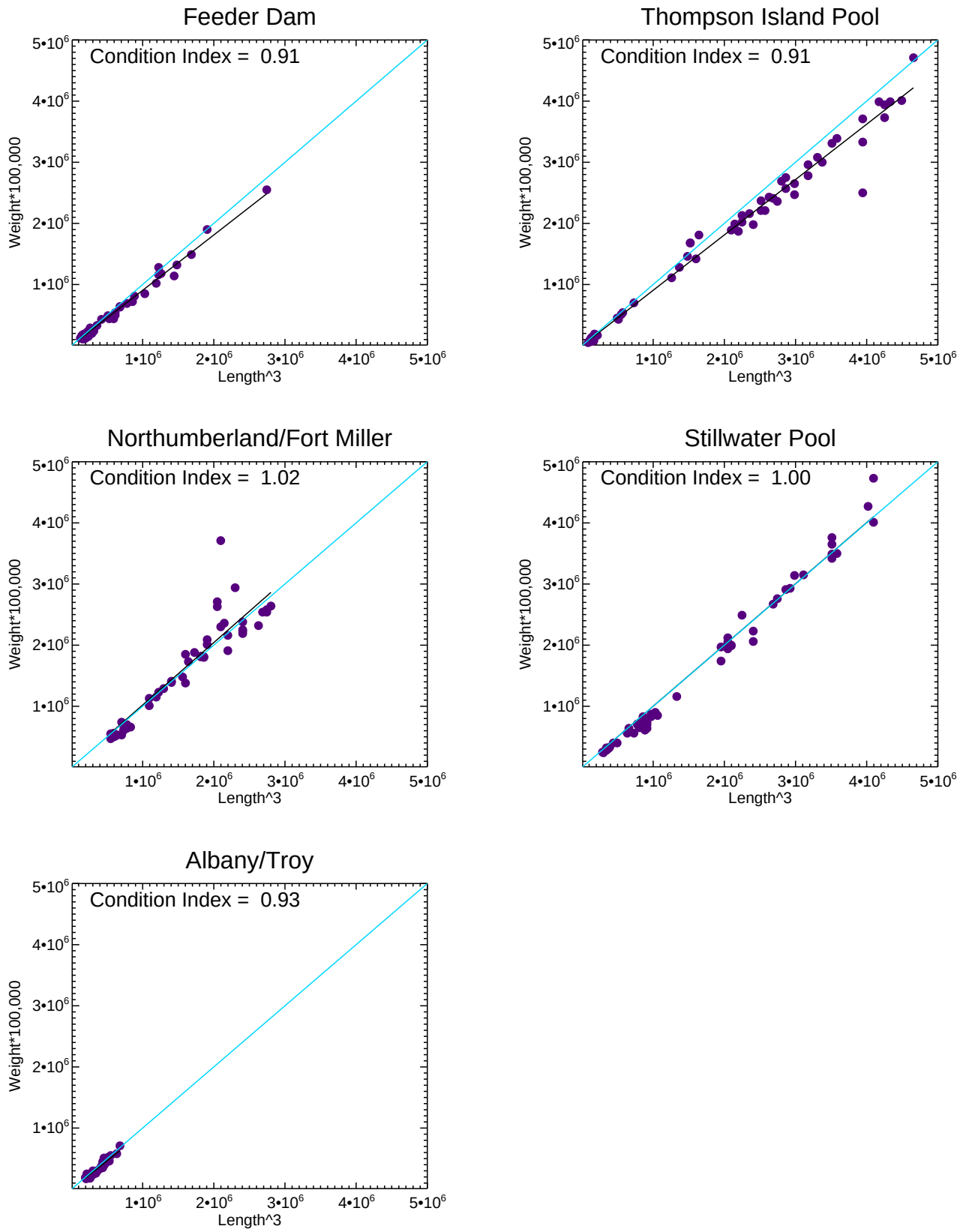

Figure 4−14
Condition Index of Forage Fish for 2013 Sampling Events
2013 Data Summary Report
Prepared for the General Electric Company
Light blue line represents the 1:1 line.

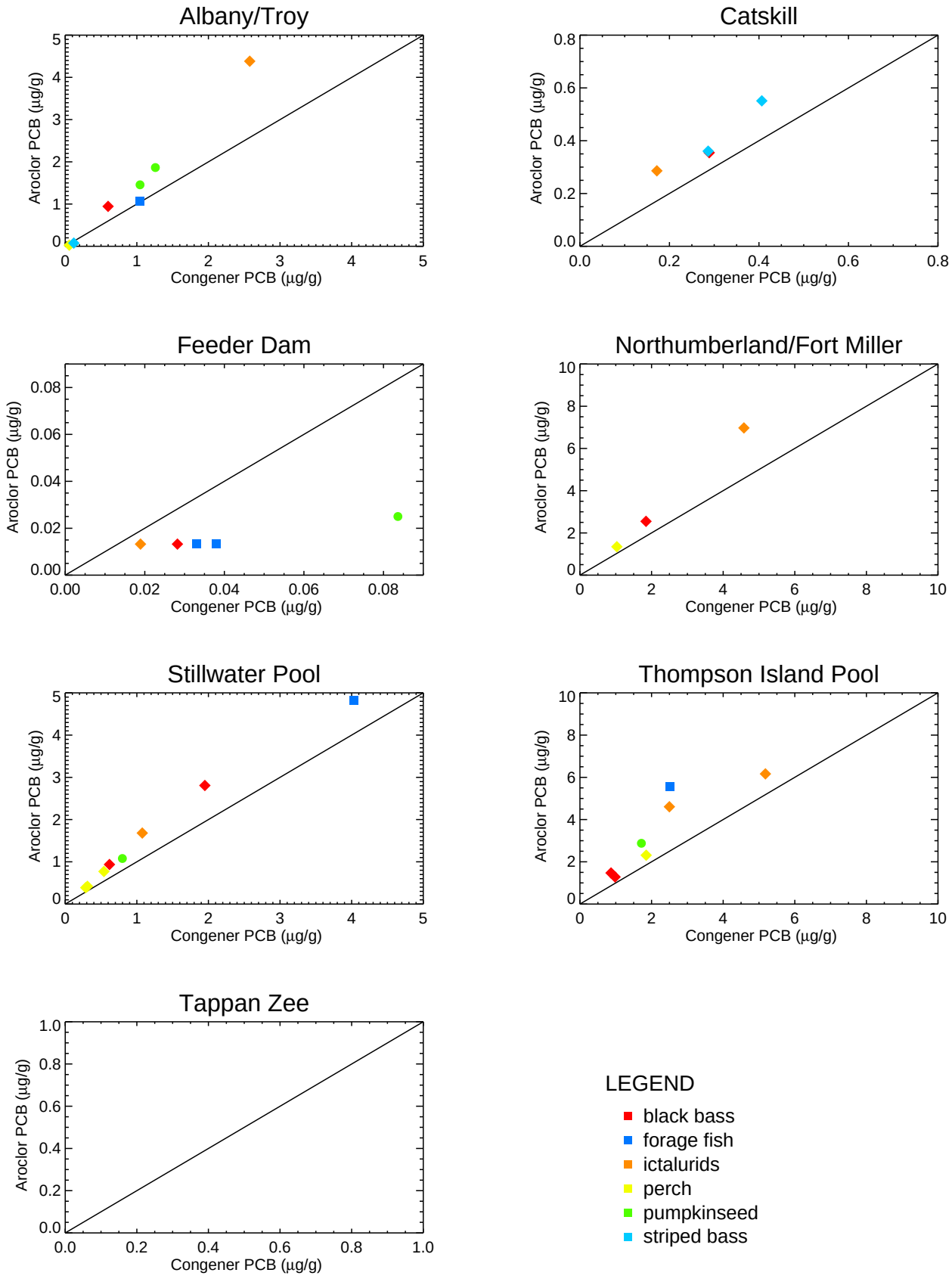

Figure 4−15

Comparison of Congener−Specific PCB Data with Aroclor PCB in Fish
2013 Data Summary Report
Prepared for the General Electric Company

Notes: Prep: diamonds = fillet; circles = whole body (individual); squares = whole body (composite); year: 2013

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